



PROGRAM MANAGER RMA CONTAMINATION CLEANUP

U.S. ARMY
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— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

Final Decision Document for the Interim Response Action for the Groundwater Intercept and Treatment System North of Basin F Rocky Mountain Arsenal

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THE GROUNDWATER INTERCEPT AND TREATMENT
SYSTEM NORTH OF BASIN F
ROCKY MOUNTAIN ARSENAL

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PREPARED FOR:

U.S. ARMY PROGRAM MANAGER'S OFFICE FOR
ROCKY MOUNTAIN ARSENAL CONTAMINATION CLEANUP

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FOR THE INTERIM RESPONSE ACTION FOR
THE GROUNDWATER INTERCEPT AND TREATMENT
SYSTEM NORTH OF BASIN F
ROCKY MOUNTAIN ARSENAL

1.0 INTRODUCTION

The Interim Response Action (IRA) for the Groundwater Intercept and Treatment System North of Basin F at Rocky Mountain Arsenal (RMA) is being conducted as part of the IRA Process for RMA in accordance with the June 5, 1987 report to the court in United States v. Shell Oil Co. and the proposed Consent Decree dated June 7, 1988.

Currently, three groundwater treatment systems are operating to prevent off-post contaminant migration. The current systems, located on the North and Northwest boundaries of RMA, use activated carbon filters to remove organic contaminants.

The proposed Consent Decree requires an IRA that is an "assessment and selection of a groundwater intercept and treatment system north of Basin F" (proposed Consent Decree, 1988). This system will consist of containment, treatment, and recharge of groundwater north of Basin F. This IRA is independent of, but will complement the on-going IRA dealing with remediation of Basin F liquids, solids, and sludges.

Alternatives for groundwater extraction, treatment, and recharge have been reviewed based on capability for timely execution, technical feasibility, compliance to the maximum extent practicable with applicable or relevant and appropriate requirements (ARARs), potential to be expanded and/or modified for incorporation into the Final Response Action, cost effectiveness among alternatives affording equivalent levels of protection, and capability to be readily implemented. Extraction will be executed by the implementation of withdrawal wells; treatment will be by carbon adsorption filter; and recharge wells will be constructed to reintroduce the treated water to the aquifer downgradient in addition to creating a hydraulic barrier.

2.0 HISTORY OF RMA BASIN F

Rocky Mountain Arsenal occupies over 17,000 acres, approximately twenty-seven square miles, of land in Adams County, directly northeast of metropolitan Denver, Colorado. (See Figure 1, installation location map.) The property was purchased by the government in 1942 for use in World War II to manufacture and assemble chemical warfare materials, such as mustard and lewisite, and incendiary munitions. Starting in the 1950's, RMA produced the nerve agent GB (isopropyl methylphosphonofluoridate) until late 1969. Between 1970, and 1982 the mission of RMA concentrated on the destruction of chemical warfare materials. From 1946 to 1982, a major portion of the plant facilities was leased to private industries (including Shell Chemical Co.) for the manufacture of various insecticides and herbicides.

During the 1940's and 1950's, liquid industrial wastes generated at both the Chemical Plants Area and the North Plants Area were routinely discharged into several unlined evaporation ponds (labeled Basins A, B, C, D, and E) located in the center of the installation. (Figure 2 shows locations of previous disposal areas and the Plants Areas in respect to the rest of RMA). Basin F was built to ensure environmentally safe solar evaporative disposal of contaminated aqueous wastes generated in the course of Army and lessee chemical manufacturing and processing activities at RMA. A catalytically blown asphalt membrane was installed to prevent the seepage of ponded wastes through bottom sediments into the underlying groundwater. When finished, the Basin had a maximum holding capacity of 243 million gallons and covered a surface area of 92.7 acres. Initially, from 1956 to 1957 approximately 60 million gallons of liquid wastes were transferred to Basin F. The liquids included process wastes from the manufacture of pesticides, herbicides, insecticides, GB, and hydrazine blending.

After August 1957, Basin F was the only solar evaporative disposal facility in use at RMA. In 1962 and 1963, the Basin was used not only for evaporative disposal, but also for the settling of aqueous wastes prior to their treatment and injection into a deep disposal well. In 1964, the Army subdivided Basin F, creating a surge and settling Basin (F-1) to support deep well disposal operations which continued until 1966. A floating spray raft, installed on Basin F in 1961, was used intermittently until 1966 for the purpose of accelerating the evaporation of retained aqueous wastes. In 1982, following the termination of Basin F as an active facility, the Army removed the underground connecting sewer lines and erected a dike around the existing fluid contents of the Basin in order to prevent further accumulations from sewer line discharges and surface runoff. Pump-fed trickler lines, operational today, were installed to enhance the evaporation of the remaining fluids.

Basin F's potential influence on air quality includes wind blown contaminated particulates from dry portions of the Basin and volatile emissions. In 1981, the U.S. Army Environmental Hygiene Agency collected particulate samples as part of a study to evaluate the potential health hazards associated with fugitive dust migration from dry disposal basins at RMA. The results of the study indicated that the concentrations of contaminants detected in the fugitive dust did not pose a significant health hazard to the general

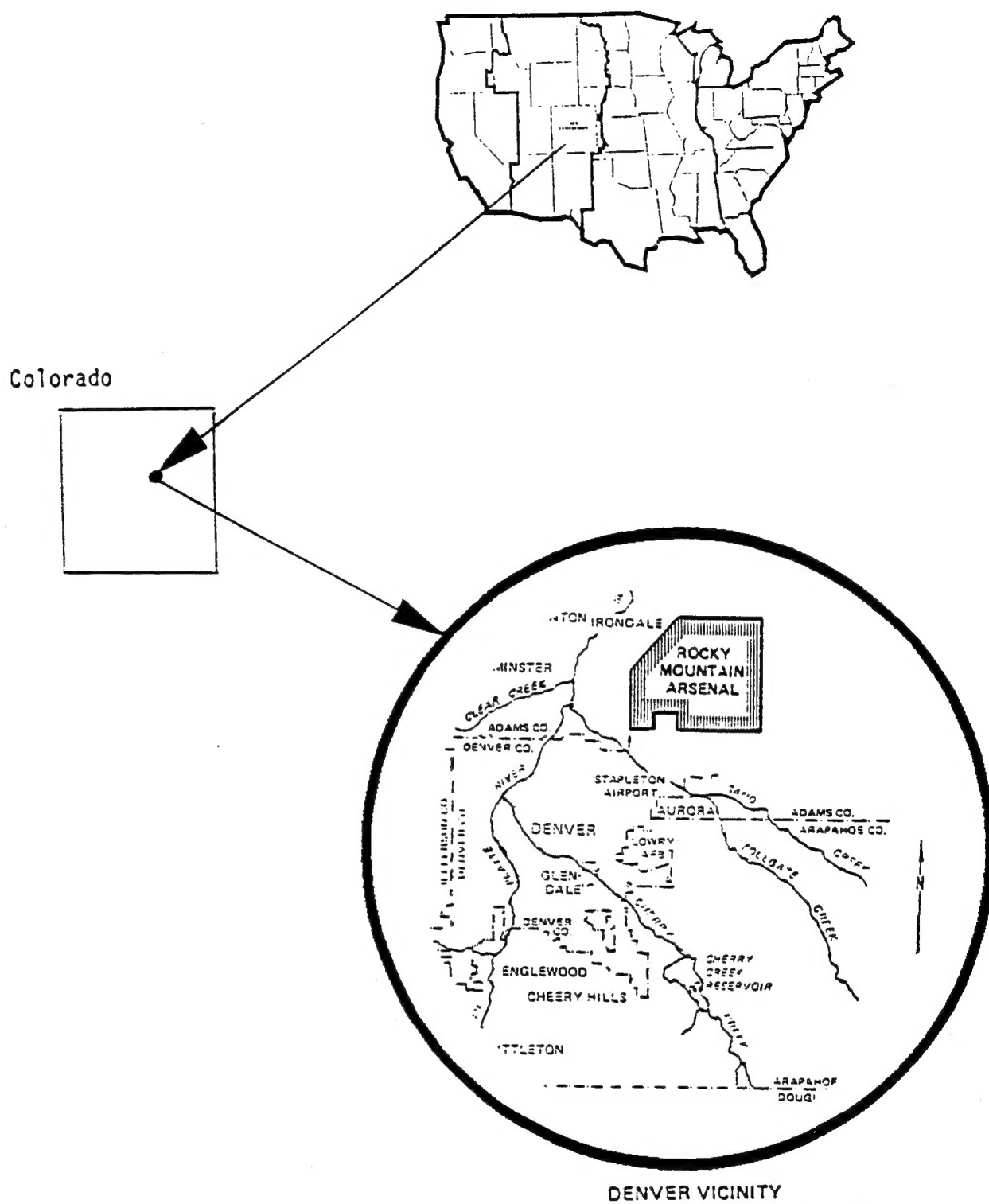


Figure 1. Installation Location Map

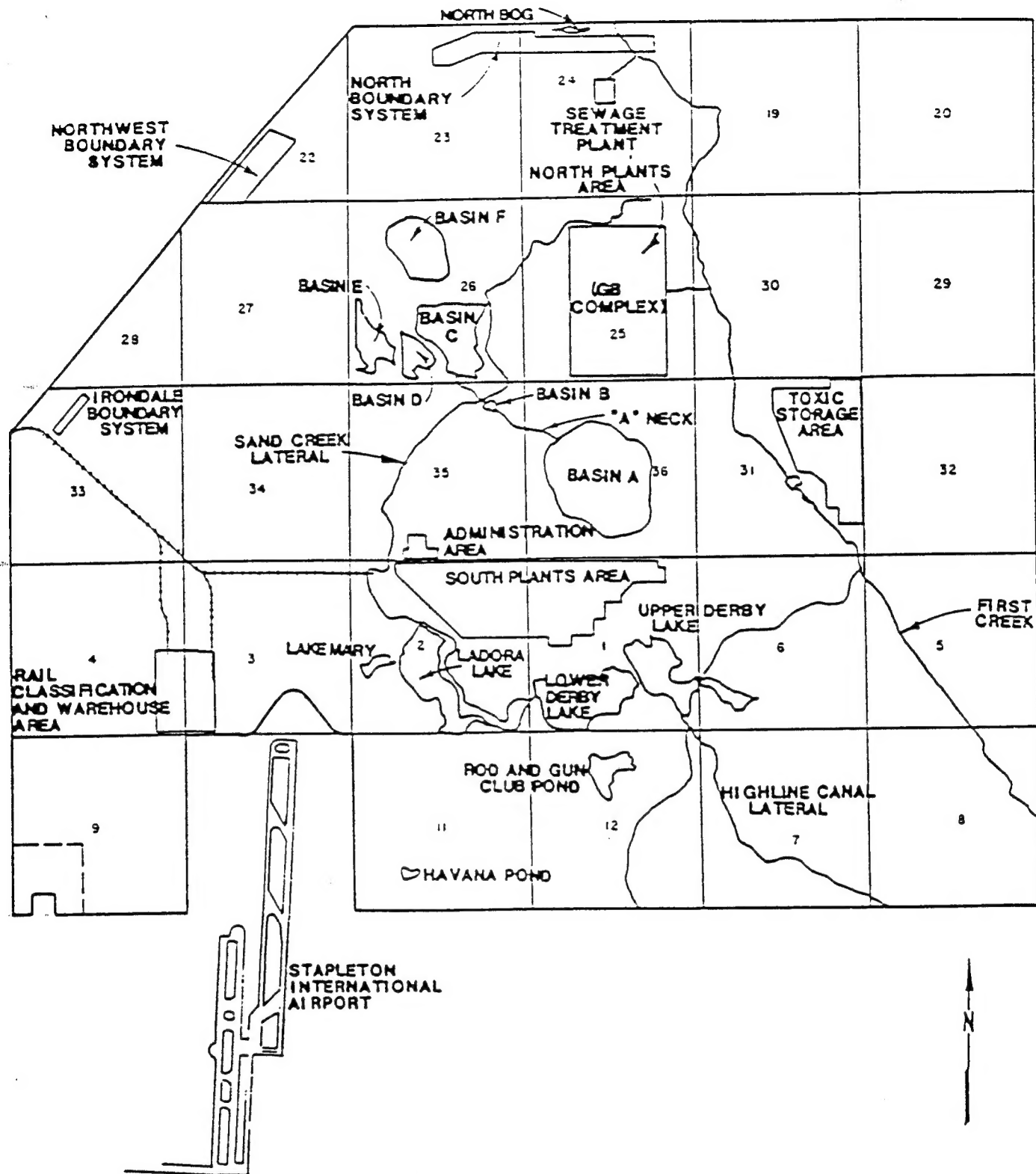


Figure 2. Rocky Mountain Arsenal Map

Source: Morrison-Knudsen Engineers, Inc.

population around RMA or to individuals working at RMA. A study of the impact of volatile organic emissions from Basin F was conducted by the U.S. Army Environmental Hygiene Agency in 1982 (USAEHA, 1982). This report concluded that any volatile emissions from Basin F did not pose a health threat to the general public or to the workers at RMA.

A number of studies have identified contaminants in the underlying groundwater in the vicinity of Basin F (RMA, 1977; RMA, 1978; Stollar and Van der Leeden, 1981; ESE, 1986b). The results of these studies suggested that Basin F might have contributed to the contaminant plumes of diisopropylmethyl phosphonate, dicyclopentadiene, chloride, and dibromochloropropane. Groundwater beneath RMA flows from southeast to northwest. Figure 3 represents generalized alluvial groundwater flow across RMA. Nevertheless, the continuing insufficiency of pertinent data currently precludes any definitive determination of whether Basin F is a major source of groundwater contamination at RMA (ESE, 1986a).

Adverse impacts have been documented for species exposed to Basin F liquids and sediments (Crane, 1965; Hiddeman, et al., 1965; Manthei, et al., 1981), with waterfowl mortality being the primary problem. Studies conducted in 1965 established the toxicity of pesticide-contaminated sediments in Basin F and F-1 to migratory waterfowl and small mammals (Crane, 1965; Hiddeman, et al., 1965). These studies also determined that the fluids of Basin F and F-1 contained no constituents toxic to wildlife (Hiddeman, et al., 1965). The phenomenon of various species of waterfowl in contact with Basin fluids experiencing a rapid wetting of their feathers that resulted in their losing body heat and the ability to float or to fly was initially attributed to the presence in Basin fluids of unknown degreasing or wetting agents (Hiddeman, et al., 1965). Detergents present in the Basin have been identified as one cause of this wetting action. Scare devices were installed in Basin F in 1975 to keep wildlife away. These devices will remain in operation until the liquids, solids and sludges have been isolated.

A source control study carried out by the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA, 1983) was conducted over a three year period that resulted in the submission of a final report in September 1983. This report identified several remedial actions to facilitate the restoration of RMA. One of the remedial actions specified was a Groundwater Intercept and Treatment System North of Basin F.

On February 1, 1988, a proposed Consent Decree was lodged in the U.S. v. Shell Oil Company with the U.S. District Court in Denver, Colorado. This proposed Decree was revised after public comments were received and a modified proposed Consent Decree was lodged with the court on June 7, 1988. The Army and Shell Oil Company agreed to share costs of the cleanup that was to be developed and performed under the oversight of the U.S. Environmental Protection Agency, with numerous opportunities for comment by the State of Colorado and the public. The long term cleanup is a complex task that will take several years to complete. To facilitate more immediate remediation activities, the proposed Consent Decree specifies a number of "interim" actions to alleviate the most urgent problems. One of these interim actions is the Groundwater Intercept and Treatment System North of Basin F.

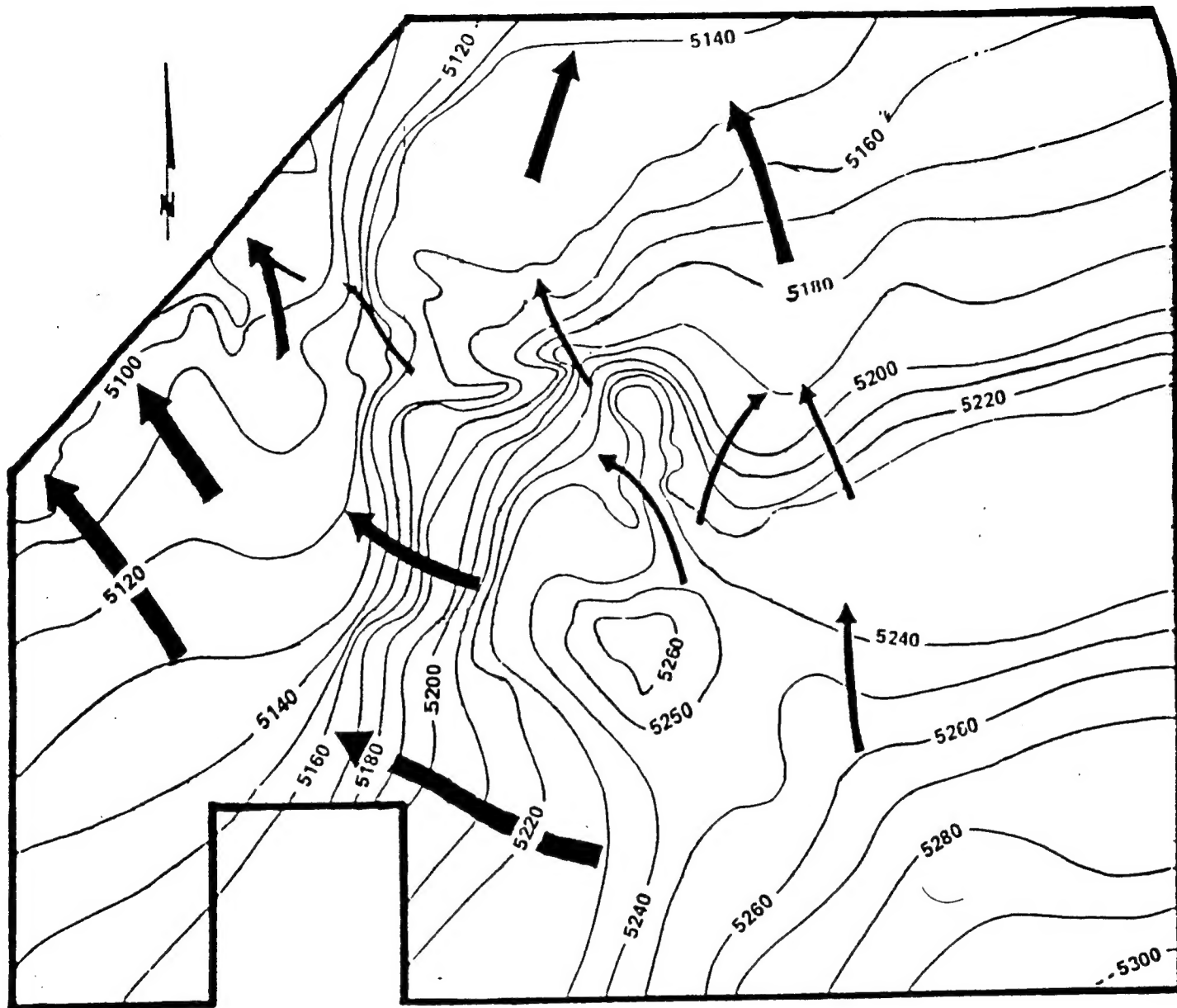


Figure 3. Generalized Alluvial Groundwater Flow Across RMA

Source: Selection of a Contamination Control Strategy for Rocky Mountain Arsenal (Witt, 1983).

3.0 INTERIM RESPONSE ACTION OBJECTIVES

The IRA for the Groundwater Intercept and Treatment System North of Basin F will begin a remediation process for contaminated groundwater in this area. Results of this IRA will include a reduction in the contaminant loading on the North Boundary Containment/Treatment System and acceleration of the clean-up of groundwater.

The specific objectives of the IRA for the Groundwater Intercept and Treatment System North of Basin F are to:

- o Initiate capture and treatment of the contaminated alluvial aquifer waters suspected to be emanating from below Basin F as soon as practicable; and
- o Collect operational data on the interception, treatment, and recharge of contaminated groundwater from this area that will aid in the selection and design of a final response action.

In addition to these specific objectives, the system as designed and constructed should adhere to good engineering practices, including:

- o Minimize maintenance
- o Be constructible as designed
- o Operate for an extended life (minimum of 5 years)
- o Be replaceable or repairable, if necessary

This decision document provides a summary of the alternative technologies considered, a chronology of the significant events leading to the initiation of the IRA, a summary of the IRA project, and a summary of the Applicable, or Relevant and Appropriate Requirements, standards, criteria, or limitations (ARARs) associated with the program.

As specified in the proposed Consent Decree, this Interim Response Action will, to the maximum extent practicable, be consistent with and contribute to the efficient performance of the Final Response Action.

4.0 INTERIM RESPONSE ACTION ALTERNATIVES

Alternatives were examined in the July 1988, "Final Groundwater Intercept and Treatment System North of Basin F Interim Response Action Alternatives Assessment," (Ebasco, 1988). The alternatives were divided into two groups - hydrogeologic and treatment. Hydrogeologic alternatives evaluated were categorized by function:

- o Extraction
- o Recharge
- o Barriers

The treatment alternatives were divided by type of contaminant that was to be treated - organic or inorganic. Table 1 lists treatment technologies that were considered and the type of contaminant that each is capable of removing.

Table 1

Applicable Treatment Technologies for Contaminated Groundwater.

<u>Treatment Process</u>	<u>Target Compounds</u>	
	<u>Organics</u>	<u>Inorganics</u>
1. Air Stripping	X	
2. Biological Treatment	X	X
3. Electrodialysis		X
4. Evaporation	X	X
5. Filtration		X
6. Activated Alumina		X
7. Ion Exchange		X
8. Carbon Adsorption	X	
9. Oxidation Process	X	
10. Precipitation		X
11. Reverse Osmosis	X	X
12. Ultrafiltration	X	

Inorganic contaminants are not presently treated in the three RMA boundary groundwater intercept/treatment systems. Moreover, the extent, if any, of control of inorganic compounds in groundwater in the final Remedial Plan is unknown at this time.

To get the system on line as soon as possible inorganic treatment capability was not taken into consideration. Most inorganic treatment is very expensive and would require extensive pilot testing. The beneficial effect of this Interim Response Action depends significantly upon getting it into operation rapidly to reduce the volume and toxicity of the contamination and reduce migration of contamination. In order to provide this rapid response, inorganic treatment systems were not included in this IRA. Addition of inorganic treatment may be made later if a benefit is identified in the future.

4.1 GROUNDWATER

4.11 EXTRACTION

Groundwater must be efficiently removed from the vicinity north of Basin F in order to treat and remove the contaminants. Two types of groundwater extraction systems are available: Dewatering wells and subsurface drains.

Wells

Groundwater extraction can be achieved by installing a series of wells. Groundwater is pumped through the wells to a collection pipe, then transferred to the treatment system. The U.S. Army Corps of Engineers (COE) conducted a feasibility study on the use of extraction wells to contain the groundwater contamination emanating from Basin F. It was determined, based on hydrogeological data, that a series of alluvial wells would be a viable alternative.

Subsurface Drains

Buried conduit can be used to carry groundwater by pumping or gravity flow. Groundwater would naturally percolate into the conduit, then be collected in a sump or some other containment system. The subsurface drains would affect the water table by creating a continuous zone of depression. A subsurface drainage system could achieve the same goal as the well system.

A drawback of the subsurface drains is the handling of the large quantities of potentially contaminated soil that would be excavated during construction. Any contaminated groundwater encountered during excavation would have to be pumped out to allow for construction to proceed. The contaminated groundwater would then have to be transferred to a treatment facility or stored until this system's treatment facility becomes operational.

4.12 RECHARGE

Four methods of groundwater recharge were considered: (1) wells, (2) subsurface drains, (3) pits, and (4) leach fields.

Wells

Wells could be used to inject treated groundwater into the aquifer where it originally came from at a rate equal to extraction. By strategically placing

the recharge wells relative to extraction wells a beneficial hydraulic gradient can be created. A beneficial gradient will contain the contaminants, i.e., prevent the contaminants from flowing back under or around the extraction system. The disadvantage of this system is that the water between the extraction and recharge system is primarily clean. Some of this clean recharge water would be collected with the contaminated water in the extraction wells, thus increasing the overall operating cost.

Subsurface Drains

Recharge drains are constructed the same as subsurface drains used for extraction. By directing clean water into the subsurface drains the gravity head alone is sufficient to operate the recharge system. As with subsurface drains used for extraction, the major drawback is handling the potentially contaminated, excavated soil.

Pits and Leach Fields

The performance of recharge pits and leach fields is directly related to the vertical permeability. The permeability must be sufficient for the treated groundwater to infiltrate at an acceptable rate. The vertical permeability through the soil in the vicinity of Basin F is unknown. The presence of silt and clay layers in the soil would greatly restrict vertical movement of the water. There are known to be two general clay layers in the area; specific information and smaller layers have not been identified. It has been stated (Ebasco, 1988) that if a hydraulic barrier is going to be developed, pits or leach fields are not recommended.

4.13 BARRIERS

Groundwater flow can be influenced by the use of barriers. Using either hydraulic or physical barriers, the flow of groundwater can be stopped or obstructed to contain contaminant migration.

Hydraulic Barriers

A hydraulic barrier is created by increasing the level of groundwater in a specific area. This groundwater mound is made by adding water to the ambient flow system, thereby altering the natural hydraulic flow conditions. Recharge systems create a barrier by the formation of a groundwater mound. Extraction and recharge could be combined to create a more effective barrier. Hydraulic barriers are currently in use at the Northwest and Irondale Boundary Containment Systems of RMA.

Physical Barrier

A physical barrier is constructed by inserting a material with a permeability rate much lower than the permeability rate of the natural soil. Physical barriers can be made from a variety of materials that could be installed below ground to reduce or redirect groundwater flow.

A bentonite slurry wall would serve the purpose of preventing flow between the extraction and recharge system. This would prevent the recirculation of treated groundwater from the recharge system. A slurry wall barrier would have to be 45 feet deep and 1,000 feet long. In some locations a slurry wall may not be feasible, because it would have to exceed 80 feet in depth.

The slurry wall barrier would also provide short term backup to the hydraulic barrier in the event of a system failure. A negative effect of the barrier is that in the event that the extraction system ceases to operate, the barrier would act as a dam and the water would seek escape around or under the barrier, possibly enlarging the plume of contamination. Another drawback is that construction of a barrier would require excavation, handling, and disposal of large amounts of potentially contaminated soil. If the intercept system needed to be altered, the barrier could not be easily modified.

4.2 TREATMENT ALTERNATIVES

Treatment alternatives have been divided into two classifications based on type of contaminant treated - either organic or inorganic (see Table 1). The IRA is specified to be a rapid, cost effective solution to a particular area of concern. Inorganic contaminants were a matter of particular concern because they may cause scaling or fouling problems in the organic treatment process. Because the treatment of inorganics would involve extensive pilot testing, thereby delaying the time it takes to have the system on-line, and increasing the cost, inorganic treatment alternatives were not included in this IRA. Addition of inorganic treatment processes can be made later if problems related to inorganic compounds are identified. The following discussion examines organic treatment alternatives.

Activated Carbon

Activated carbon adsorption entails contacting organically contaminated water with activated carbon. Organic chemicals adsorb to the surface of the carbon. The process continues until the carbon is saturated. Once saturated, the carbon must be regenerated or replaced. Granular activated carbon is currently being used successfully to treat organics at the North Boundary Containment/Treatment System, the Northwest Boundary Control System, and the Irondale Containment/Treatment System on RMA. Such a system is used by the South Adams County Water and Sanitation District to successfully treat organics in off-post groundwater. The treatment has been satisfactory except for carbon fines plugging recharge wells. Advantages of the activated carbon system are:

- o It is well documented and utilized;
- o It is easy to operate; and
- o It will successfully treat mixed organics.

Disadvantages include:

- o Capital and operating costs are relatively high;
- o Regeneration is expensive; and
- o If spent carbon is not regenerated, it may require disposal as a hazardous waste.

Air Stripping

Air stripping is a mass transfer process where a contaminated water stream is mixed with clean air so that the organic substances are removed in the gas phase. Air stripping is only suited to removal of volatile organics. Air stripping is a proven technology that has been used effectively to remove many chlorinated organic compounds from drinking water.

Advantages of an air stripping system are:

- o Relatively low capital and operating cost; and
- o Simple to operate.

Disadvantages include:

- o Some target organic compounds will not be removed;
- o Incomplete removal of nonvolatile organics; and
- o Air emission control equipment may be necessary.

Biological Treatment

Biological treatment is the decomposition of contaminants by microbes which use the organic material as food. Biological systems can also be used to reduce concentrations of inorganic chemicals such as ammonia and nitrate. Biological treatment was tested in a RMA pilot study in which good results were achieved for selected organics (chloroform, benzene, and dibromochloropropane).

Advantages of the biological treatment include:

- o The adaptability of the process to a variety of contaminants;
- o The products are generally non-toxic; and
- o The process has low capital and operating cost.

Disadvantages include:

- o The process feed stream requires constant quality and quantity control;
- o The process is subject to shock upsets due to surges of toxic chemicals in the feed stream;
- o The process may not be effective for all of the organic chemicals present; and
- o Extensive pilot testing is necessary.

Evaporation

Evaporation is the use of open ponds to dissipate water and other volatile liquids, leaving nonvolatile materials. An evaporation system is generally used to treat concentrated inorganic waste streams.

Some advantages of evaporation ponds are:

- o Minimal liquid products that would require further treatment;
- o Low capital and operating cost; and
- o No operators required to run the system.

Some disadvantages are:

- o Volatile organics may require costly emission controls;
- o Evaporated water may need to be replaced in order to recharge the aquifer; and
- o Evaporating pond efficiency is dependent upon the weather.

Oxidation

Oxidation is the destruction of organic matter by changing its structure using either chemical methods or thermal methods. The products are water and carbon dioxide. Operational cost data are still unavailable because of the lack of pilot testing completed.

Some advantages of the oxidation process are:

- o The ability to achieve virtually complete destruction of toxic organics; and
- o Relative ease of operation.

Disadvantages include:

- o Extensive pilot testing is necessary to determine operating conditions, pretreatment and post-treatment requirements;
- o Potentially high capital and operating costs;
- o Pretreatment may be necessary; and
- o Products may require further treatment.

Reverse Osmosis

Reverse osmosis is a membrane separation process based on the principle of water's natural tendency to pass through a semipermeable membrane from the weak solution side to the strong solution side. Reverse osmosis can reduce concentrations of dissolved organic and inorganic compounds by 90 percent or more.

The primary advantage is:

- o It has the ability to remove inorganics, metals, and organic molecules with a molecular weight greater than 200. (Several organic compounds and their by-products produced at RMA have molecular weights greater than 200.)

Disadvantages include:

- o Extensive pilot testing necessary;
- o Pretreatment may be required;
- o Expected membrane life of 2 to 3 years;
- o High capital costs;
- o Sophisticated control equipment may be necessary; and
- o Concentrated product stream will require disposal.

Ultrafiltration

Ultrafiltration is a pressure filtration process composed of a porous membrane that is permeable to some compounds and impermeable to others. The process is applicable for organic molecules ranging in size from 500 to 500,000 molecular weight. The size of molecules are generally proportional to their weight.

Advantages of the ultrafiltration process are:

- o Removal of large organic molecules; and
- o Operational at low pressures.

Disadvantages are:

- o Small organic molecules (which are likely to be found in Basin F) within groundwater are not removed; and
- o Capital and operating costs are high.

4.2.1 SYSTEM ALTERNATIVES

4.2.1.1 HYDROGEOLOGIC ALTERNATIVES EVALUATION

All systems will use extraction and recharge technologies for dewatering and replenishing the aquifer. Both extraction wells and subsurface drains would be feasible extraction technologies. Well spacings of 80 to 100 feet (a total of 8 to 10 wells) would produce adequate extraction and would be less expensive than installing a subsurface drain to a depth of 45 feet.

If a hydraulic barrier is to be installed, feasible recharge technologies are limited to wells and trenches. Based on existing data, adequate recharge can be achieved by the installation of no more than 8 to 10 recharge wells, therefore wells would be a more cost effective option than a recharge trench.

The installation of a physical barrier in addition to a hydraulic barrier is not recommended. Disadvantages to a physical barrier north of Basin F at this time include problems of excavation, handling and disposal of a large volume of potentially contaminated soils, the inherent difficulty in making any alterations to such a barrier if modification is necessary in the future, the potential for the escape of contaminated water around or under any physical barrier during shutdown of the extraction/recharge system and the infeasibility of constructing a slurry wall at depths exceeding 80 feet at

some locations. The economic benefits gained by a physical barrier (reducing the recirculation of treated groundwater) are not expected to offset the costs of constructing such a barrier.

Because of the advantages induced by a system utilizing a hydraulic barrier only, physical barrier systems will no longer be considered in the specific context of this IRA. Leach fields and pits may not effectively produce hydraulic barriers and have been eliminated from further consideration. Of the remaining hydraulic alternatives, extraction wells and recharge wells would be more cost effective than subsurface drains and are the technologies of choice.

4.2.1.2 TREATMENT ALTERNATIVES EVALUATION

Treatment alternatives were screened on their ability to provide protection for human health and the environment, to mitigate any threat to human health and the environment, technical feasibility, reasonableness of cost, and on the time required to install the system. Activated carbon is a proven technology. The systems are not complex, are easy to operate, and do not require pilot testing.

Air stripping is a proven technology relatively easy to operate with moderately low capital and operating costs; however, some target compounds will not strip easily, thereby rendering air stripping by itself an insufficient technology. Air emission control equipment may be required because of the discharge of volatiles into the atmosphere. Air stripping is less expensive to operate than an activated carbon system.

Biological treatment will not successfully treat all of the pesticides in the Basin F groundwater. The system has potential capability to treat inorganics. Considerable pilot testing would be necessary to determine an effective biological treatment system. The process requires a constant quantity and quality of feed stream. Irregularity of either quantity or quality will cause shock upsets and toxicity problems resulting in downtime.

Evaporation is best suited for concentrated streams. Water lost to the atmosphere may have to be replaced by purchased water. Evaporation may be considered for treatment of a concentrated side stream, but will not be considered as a primary treatment technology. Evaporation could provide treatment for some inorganics.

As a promising technology, chemical oxidation would require extensive pilot testing to determine optimum operating conditions to verify that target compounds are being destroyed sufficiently and to identify process effluents. Operating costs and pretreatment requirements cannot be determined in lieu of pilot testing. Because of the uncertainties related to this process, this technology will no longer be considered.

Reverse osmosis has been proven to remove both organic and inorganic compounds with molecular weights as low as 150. Target compounds fall on both sides of this weight. Extensive pilot testing would be required to

determine pretreatment needs. High capital costs and high operating costs are also associated with the system due to extensive pretreatment needs, a limited membrane life of 2 to 3 years, and sophisticated control equipment. In addition to startup and operating costs, the process produces a concentrated stream that will require treatment and/or disposal. For these reasons this technology will no longer be considered.

Ultrafiltration is similar to reverse osmosis, therefore, having the same high startup and operating costs. Ultrafiltration is primarily used to remove organic compounds having molecular weights greater than 500. The target compounds are smaller than this, eliminating ultrafiltration from further consideration.

Based on the above discussion, the suggested treatment includes the use of an activated carbon adsorption unit, utilizing pretreatment with acid or sequesterant to reduce scaling, and then post-treatment filtration to remove carbon fines. If additional pretreatment or post-treatment is necessary, appropriate upgrades will be made to the system to achieve the desired treatment goals.

5.0 CHRONOLOGY OF EVENTS/COORDINATION WITH THE ORGANIZATIONS AND THE STATE

The significant events leading to the decision to install the previously discussed groundwater intercept and treatment system are presented below.

<u>Date</u>	<u>Event</u>
July 11, 1986	The Program Managers Office, Rocky Mountain Arsenal (PMRMA) distributed a 3-part document to the Colorado Department of Health (CDH) and other parties. The last part of the document spelled out the Basin F groundwater treatment system for the first time as an interim response action.
December 9, 1986	R. L. Stoller and Associates, Ebasco, U.S. Army Corps of Engineers, and PMRMA met to discuss groundwater in the vicinity of Basin F. Various extraction, treatment, and recharge technologies were discussed for applicability.
March 1987	PMRMA through CE requests Sirrene Environmental Consultants to perform literature research on groundwater quality and treatment systems for Basin F.
June 5, 1987	Report to Court by Army, EPA, Shell and the State describing the scope of this IRA.
June 1987	Sirrene Environmental Consultants provided to PMRMA and the U.S. Army Corps of Engineers a literature research document. Document contained detailed evaluation of treatment systems.
January 19, 1988	Parties requested by letter to provide preliminary identification of potential ARARs.
February 4, 1988	Meeting between PMRMA, RMA personnel, Ebasco, and the U. S. Army Corps of Engineers to discuss approach to be undertaken for the interim response action.
March 2, 1988	PMRMA sent the U.S. Army Corps of Engineers reauthorization to proceed with Basin F, IRA. The Corps continued progress on evaluating various technologies.
March 17, 1988	PMRMA notified all parties that the Sirrene report was available for review.
March 22, 1988	The U. S. Army Corps of Engineers contracted with IT Corporation for pre-design work.

<u>Date</u>	<u>Event</u>
April 7, 1988	PMRMA and the U. S. Army Corps of Engineers had a status review meeting. PMRMA received Scope of Work for final pre-design field work.
May 2, 1988	Ebasco completed the "Draft Final Groundwater Intercept and Treatment System North of Basin F, Interim Response Action Alternatives Assessment". It recommended use of dewatering and recharge wells to create a hydraulic barrier and extract groundwater and a groundwater treatment system composed of activated carbon, supported by pretreatment for scaling and post-treatment filtration to prevent carbon fines from clogging recharge wells. PMRMA issues Draft Final Alternatives Assessment to parties.
May 3, 1988	Draft ARARs released to parties under separate cover. ARARs will be taken into consideration during design, construction and operation of system.
June 1, 1988	Comments received from Shell on draft ARARs and Alternatives Assessment.
June 2, 1988	Comments received from EPA on Alternatives Assessment and draft ARARs.
June 2, 1988	Comments received from the Department of Interior Fish and Wildlife Commission on Alternatives Assessment.
June 6, 1988	Late comments arrived from CDH on Alternatives Assessment and draft ARARs.
July 5, 1988	Final Alternatives Assessment sent to organizations and the State.

6.0 SUMMARY OF THE INTERIM RESPONSE ACTION PROJECT

A hydrogeologic system consisting of extraction wells and recharge wells will be used without an intervening physical barrier. The system will utilize 8 to 10 extraction wells spaced at approximately 100 foot intervals. The recharge wells will mirror the extraction wells and be located 200 feet hydraulically downgradient of the extraction wells. It was estimated, using the U.S. Army Corps of Engineers model (U.S. Army of Corps of Engineers, 1987), that this system could extract groundwater at a rate of 110 to 160 gallons per minute (gpm).

The groundwater treatment system will be a carbon adsorption unit followed by filtration. The system will utilize pretreatment with acid or sequesterant to prevent precipitation of calcium and magnesium, two activated carbon adsorption units in series to remove organic contaminants, and filtration of effluent to remove carbon fines and prevent clogging of recharge wells. The use of an air stripper in conjunction with the carbon adsorption may substantially reduce operating costs. However, an air stripping unit has not been included in the preliminary design, because of air emission and operational data gaps that must be addressed prior to implementation. The treatment system will be designed to allow for the addition of an air stripper in the future. The addition of an air stripper would require further evaluation of air emission limitations as potential ARARs.

Support units will include a sump to stabilize influent concentrations and flow, and a holding/settling tank for batch treatment of backwash waters. The treatment system must be sheltered to prevent freezing during the winter months.

The system will be designed with sufficient flexibility to allow for possible future modifications which may provide treatment for inorganics.

6.1 HEALTH AND SAFETY PLAN

A health and safety plan has been developed for the prevention of occupational injuries and illnesses during field activities at RMA. This plan addresses health and safety requirements of contractors and their authorized subcontractors. Compliance with this plan will be compulsory and the contractors will be responsible for self-enforcement and compliance with this plan. The health and safety plan was developed taking into consideration known hazards as well as potential risks. Comprehensive environmental monitoring and site-specific personal protection are combined in an effort to best protect workers.

A site specific health and safety plan for work to be performed on the Groundwater Intercept and Treatment System North of Basin F will be developed and included with the Implementation Document.

7.0 IRA PROCESS

With respect to this IRA for the Groundwater Intercept and Treatment System North of Basin F, the IRA process is as follows:

1. The scope of the IRA was described in the June 5, 1987 report to the Court of the United States (the Army and EPA), Shell and the State in United States v. Shell Oil Co. The scope was similarly described in the proposed Consent Decree.

2. The EPA, Shell and the State were afforded an opportunity to identify, on a preliminary basis, any potential APARs.

3. The Army then prepared a draft final Groundwater Intercept and Treatment System North of Basin F IRA assessment and a draft of the ARARs document that was submitted to the other organizations, the State, and the DOI for review and comment. Comments were to be submitted up to 30 days after receipt of the draft final assessment. Promptly after the close of the comment period, the Army transmitted a final assessment to the DOI, the State, and other Organizations.

4. The Army is issuing this proposed Decision Document for the IRA for the Groundwater Intercept and Treatment System North of Basin F for a 30-day public comment period. Approximately two weeks into the 30-day comment period, a public meeting will be held in Denver, CO. The proposed Decision Document is also supported by an administrative record.

5. Promptly after the close of the comment period on the proposed Decision Document, the Army shall transmit to the Organizations and the State a draft final IRA Decision Document.

6. Within 20 days of issuance of the draft final Decision Document for the Groundwater Intercept and Treatment System North of Basin F, an Organization (or DOI where appropriate) may invoke Dispute Resolution.

7. After the close of the period for invoking Dispute Resolution (if Dispute Resolution is not invoked) or after the completion of Dispute Resolution (if invoked), the Army shall issue a final Decision Document for the Groundwater Intercept and Treatment System North of Basin F. The Army shall also notify the public of the availability of the final IRA Decision Document with the supporting record. Only preliminary design work for the IRA may be conducted prior to the issuance of the final IRA Decision Document.

8. Thereafter, the IRA for the Groundwater Intercept and Treatment System North of Basin F may be raised for judicial review in accordance with Sections 113 and 121 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. 9613 and 9621.

8.0 ARARs

8.1. ATTAINMENT OF ARARs

The interim action process reported to the court on June 5, 1987, in United States v. Shell Oil Co. provides that the IRAs (including this IRA to intercept and to treat groundwater north of Basin F) shall, to the maximum extent practicable, attain ARARs. A similar provision appears in Paragraph 9.7 of the proposed Consent Decree.

8.2 IDENTIFICATION AND SELECTION OF ARARs

Paragraph 9.7 of the proposed Consent Decree provides that the Organizations, DOI and the State shall have an opportunity to participate at the RMA Committee level, in the identification and selection of ARARs that may be applicable to the IRAs. The Army is to present its proposed decision on ARARs to the other Organizations, DOI and the State prior to, or as part of, the draft IRA Assessment.

In this instance, the Army requested in a January 19, 1988 letter by counsel that the EPA, Shell and the State nominate by February 12, 1988 any ARARs that they believed warranted initial consideration by the Army in connection with this IRA. No responses were received to these letters.

Draft ARARs were provided to the parties in May, 1988, and all parties submitted comments in June, after which the Army revised these draft ARARs for this IRA.

8.3 SELECTION OF ARARs AND DETERMINATION OF ARAR IMPACT

8.3.1 AMBIENT OR CHEMICAL-SPECIFIC ARARs

Ambient or chemical-specific requirements set health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants or contaminants. Such ARARs either set protective cleanup levels for the chemicals of concern in the designated media or indicate an appropriate level of discharge.

The objectives of this IRA are stated in Section 3.0. A further significant result of this IRA is to reduce the level of contamination in the groundwater north of Basin F which will improve the efficiency and efficacy of treatment by the RMA boundary systems and accelerate the clean-up of groundwater. This IRA will be implemented prior to the final remediation to be undertaken in the context of the On-post Operable Unit ROD.

For this IRA, the Army has selected an existing "off-the-shelf" technology for interim remediation of the groundwater north of Basin F, consistent with the IRA emphasis on speed of implementation, which the Army fully anticipates will also achieve, at the point of reinjection of the treated groundwater, the following selected limitations that are relevant and appropriate under the circumstances of the potential release for the CERCLA hazardous substances specified below:

(1) Arsenic

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 50 ug/l.
(Source: 40 CFR Section 141.11(b) (NPDW-MCL) and 40 CFR Section 264.94(a) (2) (RCRA))

(2) Benzene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 5 ug/l.
(Source: 40 CFR Section 141.61(a), 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

(3) Carbon Tetrachloride

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 5 ug/l.
(Source: 40 CFR Section 141.61(a), 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

(4) Chlorobenzene (Monochlorobenzene)

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 488 ug/l.
(Source: 45 Fed. Reg. 79327-79328 (1980) (AWQC-Human Health))

(5) Chloroform

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 100 ug/l.
(Source: 40 CFR Section 141.12 (NPDW-MCL) (Note that this is the total combined limit for this and all other trihalomethanes.))

(6) DDT

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 10 ug/l.
(Source: 40 CFR Section 129.101(a) (3) (TPES))

(7) 1,2-Dichloroethane

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 5 ug/l.
(Source: 40 CFR Section 141.61(a); 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

(8) 1,1-Dichloroethylene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 7 ug/l.
- (d) (Source: 40 CFR Section 141.61(a), 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

(9) Dieldrin

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 0.12 ug/l.
(Source: 40 CFR Section 129.100(a) (3) (TPES))

(10) Endrin

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 0.2 ug/l.
(Source: 40 CFR Section 141.12 (NPDW-MCL))

(11) Hexachlorocyclopentadiene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 206 ug/l.
(Source: 45 Fed. Reg. 79336 (1980) (AWQC-Human Health))

(12) Mercury

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 2 ug/l.
(Source: 40 CFR Section 141.11(b) (NPDW-MCL) and 40 CFR Section 264.94(a) (2) (RCRA))

(13) 1,1,1-Trichloroethane

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 200 ug/l.
(Source: 40 CFR Section 141.61(a); 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

(14) Trichloroethylene (TCE)

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 5 ug/l.
(Source: 40 CFR Section 141.61(a); 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

Other selected limitations that were considered relevant and appropriate for this IRA but are not practicable to attain within its context, while maintaining the necessary speed of implementation which makes this IRA beneficial and cost-effective are listed below. While this IRA will provide substantial benefits and significant treatment of groundwater inside of the Arsenal, some compounds, particularly inorganics, are not expected to be treated to selected levels. However, the significant benefits that can be attained by the relatively rapid implementation of this system IRA make going forward with its implementation the appropriate course of action to take. Compounds requiring additional treatment in the future may be addressed by improvements to this system or within the context of the Final Response Action or both, as appropriate. These compounds are:

(1) Chromium

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 50 ug/l
- (d) (Source: 40 CFR Section 141.11(b)(NPDW-MCL))

(2) Fluoride

- (a) CERCLA Hazardous Substance: No
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 4000 ug/l
(Source: 40 CFR Sec. 141.11(c)(NPDW-MCL))

The Army has selected, and anticipates attaining, the following limitation which is based upon the currently available health data for the listed compound for which there is no promulgated standard:

(1) DIMP

- (a) CERCLA Hazardous Substance: No
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 9730 ug/l
(Source: Technical Report 8302, U.S. Army Medical Bio-engineering Research & Development Laboratory, October 1984)

A list of target analytes for this IRA is contained in Table 4.3-1 of the Final Alternatives Assessment. Target analytes for which promulgated standards were not found were Chlorophenylmethyl sulfide, Chlorophenylmethyl sulfone, Chlorophenylmethyl sulfoxide, Dibromochloropropane, Dicyclopentadiene, Dithiane and Methylene Chloride. It is anticipated that these compounds will receive substantial treatment by the system contemplated by this IRA.

If further contaminants are identified after the implementation of the treatment system, chemical-specific ARARs will be reviewed for such contaminants and established, as appropriate.

8.3.2 LOCATION-SPECIFIC ARARs

Location-specific requirements set restrictions on activities depending on the characteristics of the site or the immediate environment. These requirements function like action-specific requirements. Alternative remedial actions may be restricted or precluded depending on the location or characteristics of the site and the requirements that apply to it.

With respect to this interim action, the provisions of 40 CFR 141.5 (siting requirements for public water systems) are relevant and appropriate. The foregoing regulation does not constitute an "applicable" location-specific ARAR in this context. The Basin F intercept and treatment system does not constitute a public water system, and no one is drinking or is to drink water to be treated by this system. The regulatory jurisdiction of the Safe Drinking Water Act and the National Primary Drinking Water Regulations is not applicable. In these circumstances, the nature of the remedial action is such that the jurisdictional prerequisites of these requirements are not met. Thus, the identified regulation is not applicable here.

Nevertheless, Section 141.5 does address location-specific problems or situations sufficiently similar to those encountered at the RMA CERCLA site so that use of this regulation is well-suited to the site and accordingly it will be treated as "relevant and appropriate." A requirement that is "relevant and appropriate" must be complied with to the same degree as if applicable. However, there is more discretion in this determination. It is possible for only part of a requirement to be considered "relevant and appropriate", the rest being dismissed if judged not to be "relevant and appropriate" in a given case.

Accordingly, the Basin F intercept and treatment system will be located to conform to the substantive siting provisions of 40 CFR 141.5 as follows:

- (i) The system will not be located where there is a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of these improvements; and
- (ii) The system will not be located within the floodplain of a 100-year flood.

It should be noted that Paragraphs 23.2(e) and (f) of the proposed Consent Decree provide that:

- (e) Wildlife habitat(s) shall be preserved and managed as necessary to protect endangered species of wildlife to the extent required by the Endangered Species Act, 16 U.S.C. 1531 et seq., migratory birds to the extent required by the Migratory Bird Treaty Act, 16 U.S.C. 703 et seq., and bald eagles to the extent required by the Bald Eagle Protection Act, 16 U.S.C. 668 et seq.

- (f) Other than as may be necessary in connection with a Response Action or as necessary to construct or operate a Response Action Structure, there shall be no change permitted in the geophysical characteristics of RMA that has a significant effect on the natural drainage at RMA for floodplain management, recharge of groundwater, operation and maintenance of Response Action Structures, and protection of wildlife habitat(s).

While these provisions are not ARARs, they obviously must be complied with for purposes of this IRA. Based on where the Basin F intercept and treatment system will be located, as well as when and where the IRA will take place, the Army believes that this IRA will have no adverse impact on any endangered species or migratory birds, or on the protection of wildlife habitats. The U.S. Fish and Wildlife Service, by letter dated June 2, 1988, concurred in this opinion. No wetlands are in the area where construction is contemplated that could be adversely affected by this IRA.

Moreover, the Army has separately determined that this IRA will not change the physical characteristics of RMA in a manner that will have significant effect on the natural drainage of RMA for floodplain management, recharge of groundwater and the operation and maintenance of Response Action Structures.

8.3.3 PERFORMANCE, DESIGN OR OTHER ACTION-SPECIFIC ARARs

8.3.3.1 DESCRIPTION

Performance, design or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous substances, pollutants, or contaminants. These action-specific requirements may specify particular performance levels, actions or technologies, as well as specific levels (or a methodology for setting specific levels) for discharged or residual chemicals.

8.3.3.2 CONSTRUCTION OF INTERCEPT AND TREATMENT SYSTEM

(i) Air Emissions

On the remote possibility that there may be air emissions during the course of the construction of the Basin F intercept and treatment system, the Army has reviewed all potential ambient or chemical-specific air emission requirements. As a result of this review, the Army found that there are, at present, no National or State ambient air quality standards currently applicable or relevant and appropriate to any of the volatile or semi-volatile compounds and, even if such a release did occur, it would only be intermittent and of very brief duration (because the activity that produced the release would be stopped and modified appropriately if a significant air emission was detected by the contractor's air monitoring specialist). The Health and Safety Plan developed for this IRA will describe specific monitoring plans and work modification procedures.

The NESHAPS standards contained in 40 CFR Part 61 were considered as potential ARARs and determined to be neither applicable nor relevant and appropriate. These regulations apply to stationary sources of these pollutants and are, therefore, not considered applicable to this IRA. These regulations were not considered relevant and appropriate to apply to this IRA because they were developed for emissions from manufacturing processes which are significantly dissimilar from the short term construction activity which will take place during this IRA. The Army recognizes that when the actual system is designed it may include equipment which is somewhat similar to a stationary source and if the design does include such equipment, the NESHAPS standards will be reviewed again to determine whether they should be applied to the operations of this IRA. The later addition of air stripping equipment, if considered appropriate, will require evaluation of NESHAPS standards as potential ARARs.

(ii) Worker Protection

With respect to the workers directly participating in this IRA, the worker protection requirements of Section 126 of the Superfund Amendments and Reauthorization Act of 1986 shall be met through compliance with the OSHA interim final rule that appears in 51 Fed. Reg. 45654 (1986).¹

(iii) General Construction Activities

The following performance, design or other action-specific State ARARs are selected by the Army as relevant and appropriate to this portion of the IRA and more stringent than any applicable or relevant and appropriate Federal standard, requirement, criterion or limitation:

- (i) Colorado Air Pollution Control Commission Regulation No. 1, 5 CCR 100-3, Part III(D) (2) (b), "Construction Activities":

(i) Applicability - Attainment and Nonattainment Areas

(ii) General Requirement

Any owner or operator engaged in clearing or leveling of land or owner or operator of land that has been cleared of greater than one (1) acre in nonattainment areas from which fugitive particulate emissions will be emitted shall be required to use all available and practical methods which are technologically

¹Although OSHA proposed a permanent final rule on August 10, 1987, 52 Fed. Reg. 29620, the comment period on this rule did not close until October 5, 1987.

It should be noted that, pursuant to CERCLA Section 301(f), 42 U.S.C. 9651(f), the NCP is to be amended by December 11, 1988 to provide procedures for the protection of the health and safety of employees involved in response actions.

feasible and economically reasonable in order to minimize such emissions, in accordance with the requirements of Section III.D. of this regulation.

(iii) Applicable Emission Limitation Guideline

Both the 20% opacity and the no off-property transport emission limitation guidelines shall apply to construction activities; except that with respect to sources or activities associated with construction for which there are separate requirements set forth in this regulation, the emission limitation guidelines there specified as applicable to such sources and activities shall be evaluated for compliance with the requirements of Section III.D. of this regulation.

(Cross Reference: Subsections e. and f. of Section III.D.2 of this regulation.)

(iv) Control Measures and Operating Procedures

Control measures or operational procedures to be employed may include, but are not necessarily limited to, planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques.

. . . .

(ii) Colorado Ambient Air Quality Standards, 5 CCR 1001-14, Air Quality Regulation A, "Diesel-Powered Vehicle Emission Standards for Visible Pollutants":

- a. No person shall emit or cause to be emitted into the atmosphere from any diesel-powered vehicle any air contaminant, for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity, with the exception of Subpart B below.
- b. No person shall emit or cause to be emitted into the atmosphere from any naturally aspirated diesel-powered vehicle of over 8,500 lbs gross vehicle weight rating operated above 7,000 feet (mean sea level), any air contaminant for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 50% opacity.
- c. Diesel-powered vehicles exceeding these requirements shall be exempt for a period of 10 minutes, if the emissions are a direct result of a cold engine start-up and provided the vehicle is in a stationary position.

- d. This standard shall apply to motor vehicles intended, designed and manufactured primarily for use in carrying passengers or cargo on roads, streets and highways.

The following performance, design or action-specific State ARAR is applicable to this portion of the IRA and is more stringent than any applicable or relevant and appropriate Federal standard, requirement, criterion or limitation:

(iii) Colorado Noise Abatement Statute, C.R.S. Section 25-12-103:

- (1) Every activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of twenty-five feet or more therefrom in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

<u>Zone</u>	<u>7:00 a.m. to next 7:00 p.m.</u>	<u>7:00 p.m. to next 7:00 a.m.</u>
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light Industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

- (2) In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in subsection (1) of this section may be increased by ten db(A) for a period of not to exceed fifteen minutes in any one-hour period.
- (3) Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five db(A) less than those listed in subsection (1) of this section.

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- (5) Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.

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- (8) For the purposes of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.
- (9) In all sound level measurements, consideration shall be given to the effect of the ambient noise level created by the encompassing noise of the environment from all sources at the time and place of such sound level measurements.

In substantive fulfillment of Colorado Air Pollution Control Commission Regulation No. 1, this IRA will employ the specified methods for minimizing emissions from fuel burning equipment and construction activities. In substantive fulfillment of Colorado's Diesel-Powered Vehicle Emission Standards, no diesel motor vehicles associated with the construction shall be operated in a manner that will produce emissions in excess of those specified in these standards.

The noise levels pertinent for construction activity provided in C.R.S. Section 25-12-103 will be attained in accordance with this applicable Colorado statute.

(iv) Removal of Soil

There are no action-specific ARARs that pertain to the drilling or excavation of soil during the construction of the Basin F intercept and treatment system IRA.

Although not an ARAR, removal of soil from the areas where the intercept and treatment system will be located will be performed in accordance with the procedures set forth in the Task No. 32 Technical Plan -- Sampling Waste Handling (November 1987) and EPA's July 12, 1985 memorandum entitled "EPA Region VIII procedure for handling of materials from drilling, trench excavation and decontamination during CERCLA RI/FS operations at the Rocky Mountain Arsenal." In general, any soils generated by drilling or excavation during the course of this IRA, either at surface or subsurface, will be returned to the location from which they originated (i.e., last out, first in). Any materials remaining after backfilling has been completed that are suspected of being contaminated based on field screening techniques,² will be properly stored, sampled, analyzed, and ultimately disposed of as CERCLA hazardous wastes,³ as appropriate.

²The field screening techniques to be used to determine contamination are HNU, OVA, discoloration (visual) and odor. Readings or visual and odor inspection will be taken at least every five feet.

³It should be noted that the "land ban" provisions of RCRA Section 3004, 42 U.S.C. 6924, may be applicable to any such excavated soil that is identified as contaminated. Guidance concerning this matter is currently being developed by Headquarters, U.S. EPA.

For materials determined to be hazardous waste, substantive RCRA provisions are applicable to their management. These substantive provisions include, but are not limited to; 40 CFR Part 262 (Subpart C, Pre-Transport Requirements), 40 CFR Part 263 (Transporter Standards), and 40 CFR Part 264 (Subpart I, Container Storage and Subpart L, Waste Piles). The specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage or disposal techniques actually applied to any such material.

9.0 SCHEDULE

The Draft Implementation Document will be completed August 20, 1989. The construction schedule will be contained in the Draft Implementation Document for this IRA. This milestone has been developed based upon the Final Assessment Document and the assumption that no dispute resolution will occur. If events occur which necessitate a schedule change or extension, the change will be incorporated in accordance with the discussion in Section XVIII of the RI/FS Process Document.

10.0 CONSISTENCY WITH THE FINAL REMEDIAL ACTION

The proposed Consent Decree (1988) stipulates that all IRAs shall "to the maximum extent practicable, be consistent with and contribute to the efficient performance of Final Response Actions" (paragraph 9.5).

The alternatives assessment criteria (Ebasco, 1988) were used to evaluate the hydrogeological and treatment alternatives. The Groundwater Intercept and Treatment System North of Basin F will be consistent with any Final Response Actions selected for RMA.

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RIC83326R01

Witt, M., Campbell, D., U.S. Army Toxic and Hazardous Materials Agency, Rocky Mountain Arsenal Contamination Cleanup, Aberdeen Proving Ground, Maryland. "Selection of a Contamination Control Strategy for Rocky Mountain Arsenal", September 1983.

RIC88141R03

Decision Document for the Interim Action of Basin F Hazardous Waste Cleanup, Rocky Mountain Arsenal", Final 1988.

APPENDIX
COMMENTS AND RESPONSES



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

Ref: 8HWM-SR

SEP 28 1988

Mr. Donald L. Campbell
Deputy Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-TO
Commerce City, Colorado 80022-2180

Re: Rocky Mountain Arsenal (RMA),
Proposed Decision Document for the
Interim Response Action for the
Groundwater Intercept and Treatment
System North of Basin F, August,
1988.

Dear Mr. Campbell:

We have reviewed the above referenced report and have the
enclosed comments which will require revisions to the document.
Please contact me at (303) 293-1528, if there are questions on
this matter.

Sincerely,

A handwritten signature in cursive script that reads "Connally Mears".

Connally Mears
EPA Coordinator
for Rocky Mountain Arsenal Cleanup

Enclosure

cc: Thomas P. Looby, CDH
David Shelton, CDH
Patricia Bohm, CAGO
Lt. Col. Scott Isaacson
Chris Hahn, Shell
R. D. Lundahl, Shell
David Anderson, DOJ

COMMENTS ON THE PROPOSED DECISION DOCUMENT
FOR THE INTERIM RESPONSE ACTION FOR
THE GROUNDWATER INTERCEPT AND TREATMENT SYSTEM
NORTH OF BASIN F
AUGUST, 1988

1. We have the following comments on the chemical-specific ARARs listed on pages 20-22.

a. It would help to have in this document a list that is comprehensive and inclusive of all contaminants present in the groundwater.

b. Page 20, bottom paragraph, the language should state "selection" of the limits from the respective laws (which should be identified) as ARARs for this IRA. Then identify the extent to which they can be achieved.

c. Page 20, ARARs for inorganics must be identified. Then justification should be provided why it is or is not now practicable to meet them as part of this IRA.

d. If additional contaminants are found after the treatment process commences, chemical-specific ARARs should be established for them.

e. If there are sufficient quantities of solvents, dioxin, California list wastes (As, Cd, Cr VI, Pb, Hg, Ni, Se, and Tl) or first third wastes listed as RCRA hazardous wastes present, possible land ban implications should be addressed. The footnote on page 28 needs revision.

2. There was no analysis of wetlands to state the absence or presence of possible impacts.

3. Risk-based levels should be considered when they exist for contaminants of concern. EPA expects to soon release a health assessment for DIMP. When results from such assessments become available, they should be reviewed as potential action levels for the IRA currently or in future revisions.

4. To comply with the proposed Consent Decree:

a. On page 15, the analysis should evaluate the alternatives against the criteria in Section 9.6 of the Decree.

b. On page 29, the scheduling discussion should provide IRA construction start and completion deadlines as provided in Section 9.8 of the Decree.

5. Page 7, first paragraph, second sentence, and page 20, section 8.3.1, second paragraph, add "and to accelerate the cleanup of the groundwater".

6. Page 7, second paragraph, the first objective should state "initiate capture and treatment of the contaminated . . ."

7. Page 7, last paragraph, add "and attain ARARs".

8. In several locations, including pages 8, 9, 11, 15, and 18, in discussing possible inorganic treatment: a) The design needs to be flexible to allow the later addition of inorganic treatment and to be consistent with a final remedy. b) Especially on page 9, top, the statement that "inorganic treatment systems were not evaluated" is incorrect since, in fact, several were evaluated (see Table 1, page 8, text on page 12, and elsewhere). It would not have been acceptable to avoid such evaluations. c) Mention of inorganics treatment capabilities needs to be added throughout page 15.

9. Page 11, "Activated Carbon" section - add the Northwest Boundary System to the list of current operating systems. You might also mention the offpost applications provided for the local water district.

10. Pages 12, 13, 15, 18 and 24, if there were air emissions from the selected process, the need for air pollution control equipment would need to be evaluated, as would NESHAPS and other air program standards.

11. We agree that it now appears the hydraulic-barrier-only option will be effective for this interim action. However, there should be no implication on page 14, bottom paragraph, that the phrase "physical barrier systems will no longer be considered" applies to any other situation on the Arsenal, including to the final remedy. Further, the basis for the current conclusion should be expanded.

12. In the September 15, 1988 public meeting, on page 9 (top), and on page 15 (bottom paragraph, last sentence), the pledge has been made that appropriate upgrades will be made to the system following operational experience. We agree that future modifications may prove necessary to both the scope of treatment and the groundwater capture system. The parties will have to decide, with appropriate review by the public, under what circumstances modifications will be necessary. We expect such decisions to be made as formal modifications to the subject Decision Document, or as part of a final Record of Decision.

13. Pages 16 and 17, the text indicates there was no interaction with parties until May 2, 1988. This is inaccurate: see Section 7.0, the negotiation schedule, and filings with the Court.

14. Page 20, Section 8.2, add reference to the draft ARAR review and comments process in the May-June, 1988 timeframe.

15. Page 21, item 3, carbon tetrachloride, change "MDL" to "MCL".

16. The discussion on page 18, second paragraph describes the selected groundwater treatment system. To conform to a possible final remedy, the treatment system should be designed flexibly to allow the later incorporation of treatment for inorganics.

17. Page 22, item 14, trichloroethylene, the standard is 5ppm, not 200ppm.

18. During design, the need should be evaluated for reinjection of treated water under pressure.

RESPONSES TO COMMENTS BY THE U.S. ENVIRONMENTAL PROTECTION
AGENCY, REGION VIII, ON THE PROPOSED DECISION DOCUMENT FOR THE
GROUNDWATER TREATMENT SYSTEM NORTH OF BASIN F INTERIM RESPONSE
ACTION AT ROCKY MOUNTAIN ARSENAL

Comment 1: We have the following comments on the chemical-specific ARARs listed on pages 20-22.

a. It would help to have in this document a list that is comprehensive and inclusive of all contaminants present in the groundwater.

b. Page 20, bottom paragraph, the language should state "selection" of the limits from the respective laws (which should be identified) as ARARs for this IRA. Then identify the extent to which they can be achieved.

c. Page 20, ARARs for inorganics must be identified. Then justification should be provided why it is or is not now practicable to meet them as part of this IRA.

d. If additional contaminants are found after the treatment process commences, chemical-specific ARARs should be established for them.

e. If there are sufficient quantities of solvents, dioxin, California list wastes (As, Cd, Cr VI, pb, Hg, Ni, Se, and Tl) or first third wastes listed as RCRA hazardous wastes present, possible land ban implications should be addressed. The footnote on page 28 needs revision.

Response: 1a: The document has been revised in response to this comment.

1b: The document has been revised in response to this comment.

1c: The document has been revised in response to this comment.

1d: The Army agrees with this comment and will proceed accordingly if this situation arises.

1e: The document has been revised in response to this comment.

Comment 2: There was no analysis of wetlands to state the absence or presence of possible impacts.

Response: This analysis has been included.

Comment 3: Risk-based levels should be considered for contaminants of concern. EPA expects to soon release a health assessment for DIMP. When results from such assessments become available, they should be reviewed as potential action levels for the IRA currently or in future revisions.

Response: The Army will consider risk-based levels for contaminants of concern when there are no promulgated standards. In this context, the quality of the data and the methodology applied in the studies will be reviewed when determining whether the levels developed therein are relevant and appropriate to apply to a particular IRA. For DIMP, the Army currently intends to apply the recommended interim criteria of 9.73 mg/l contained in Technical Report 8302, prepared by the U.S. Army Medical Bioengineering Research and Development Command dated October 1984 and previously provided to the parties.

Comment 4: To comply with the proposed Consent Decree:

- a. On page 15, the analysis should evaluate the alternatives against the criteria in Section 9.6 of the Decree.
- b. On page 29, the scheduling discussion should provide IRA construction start and completion deadlines as provided in Section 9.8 of the Decree.

Response: The document has been revised in response to these comments.

Comment 5: Page 7, first paragraph, second sentence, and page 20, section 8.3.1, second paragraph, add "and to accelerate the cleanup of the groundwater".

Response: The document has been revised in response to this comments.

Comment 6: Page 7, second paragraph, the first objective should state "initiate capture and treatment of the contaminated . . ."

Response: The document has been revised in response to this comment.

Comment 7: Page 7, last paragraph, add "and attain ARARs".

Response: The addition has been made.

Comment 8: In several locations, including pages 8, 9, 11, 15, and 18, in discussing possible inorganic treatment: a) The design needs to be flexible to allow the later addition of inorganic treatment and to be consistent with a final remedy. b) Especially on page 9, top, the statement that "inorganic treatment systems were not evaluated" is incorrect since, in fact, several were evaluated (see Table 1, page 8, text on page 12, and elsewhere). It would not have been acceptable to avoid such evaluations. c) Mention of inorganics treatment capabilities needs to be added throughout page 15.

Response: The document has been revised in response to this comment.

Comment 9: Page 11, "Activated Carbon" section - add the Northwest Boundary System to the list of current operating systems. You might also mention the offpost application provided for the local water district.

Response: The document has been revised in response to this comment.

Comment 10: Pages 12, 13, 15, 18 and 24, if there were air emissions from the selected process, the need for air pollution control equipment would need to be evaluated, as would NESHAPS and other air program standards.

Response: The Army agrees with this comment and has revised the document to reflect this approach.

Comment 11: We agree that it now appears the hydraulic-barrier-only option will be effective for this interim action. However, there should be no implication on page 14, bottom paragraph, that the phrase "physical barrier systems will no longer be considered" applies to any other situation on the Arsenal, including to the final remedy. Further, the basis for the current conclusion should be expanded.

Response: The document has been revised in response to this comment.

Comment 12: In the September 15, 1988 public meeting, on page 9 (top), and on page 15 (bottom paragraph, last sentence), the pledge has been made that appropriate upgrades will be made to the system following operational experience. We agree that future modifications may prove necessary to both the scope of treatment and the groundwater capture system. The parties will have to decide, with appropriate review by the public, under what circumstances modifications will be necessary. We expect such decisions to be made as formal modifications to the subject Decision Document, or as part of a final Record of Decision.

Response: The Army generally agrees with the comment. Modifications to this IRA, if considered appropriate at some time in the future should be subject to public comment. However, the Army does not believe it appropriate to state at this time that any modification determined appropriate will be made as a formal modification to the Decision Document because a potential modification may be minor and may not be appropriate for such formal modification. While the Army will certainly give great weight to the views of the parties concerning the need for a formal modification, the Army prefers to utilize a flexible approach rather than determine now that all future modifications, which are presently unknown in scope and content, will be effected by formal modification of the Decision Document.

Comment 13: Pages 16 and 17, the text indicates there was no interaction with parties until May 2, 1988. This is inaccurate:

see Section 7.0, the negotiation schedule, and filings with the Court.

Response: The text has been revised in response to this comment.

Comment 14: Page 20, Section 8.2, add reference to the draft ARAR review and comments process in the May-June, 1988 time frame.

Response: The addition has been made.

Comment 15: Page 21, item 3, carbon tetrachloride, change "MDL" to "MCL".

Response: The correction has been made.

Comment 16: The discussion on page 18, second paragraph describes the selected groundwater treatment system. To conform to a possible final remedy, the treatment system should be designed flexibly to allow the later incorporation of treatment for inorganics.

Response: Additional discussion has been provided in response to this comment.

Comment 17: Page 22, item 14, trichloroethylene, the standard is 5ppm, not 200ppm.

Response: The correction has been made.

Comment 18: During design, the need should be evaluated for reinjection of treated water under pressure.

Response: The Army will evaluate this possibility during the design phase of this IRA.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
COLORADO FIELD OFFICE
730 SIMMS STREET
ROOM 292
GOLDEN, COLORADO 80401

IN REPLY REFER TO:

September 27, 1988

Office of Program Manager
Attn: Mr. Donald L. Campbell
Building 111, Rocky Mountain Arsenal
Commerce City, CO 80022

Dear Mr. Campbell:

We have reviewed the Proposed Decision Document for the Interim Response Action for the Groundwater Intercept and Treatment System north of Basin F at Rocky Mountain Arsenal. Our comments on this response action dated June 2, 1988 stand as submitted. We have no additional comments at this time.

Thank you for the opportunity to review the proposed action decision document.

Sincerely,

LeRoy Carlson
Acting State Supervisor

cc: Bob Stewart, DOI
Tom Jackson, FWS
Connally Mears, EPA
Doug Regan, ESE
Jean Tate, Ebasco
David Anderson, DOJ

RESPONSES TO COMMENTS SUBMITTED BY THE UNITED STATES DEPARTMENT
OF THE INTERIOR ON THE PROPOSED DECISION DOCUMENT FOR THE
GROUNDWATER TREATMENT SYSTEM NORTH OF BASIN F INTERIM RESPONSE
ACTION AT ROCKY MOUNTAIN ARSENAL

No response is necessary.

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue
Denver, Colorado 80220
Phone (303) 320-8333



Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

September 28, 1988

Mr. Donald Campbell
Deputy Program Manager
Office of the Program Manager
for the Rocky Mountain Arsenal
AMXRM-PM, Building 111
Commerce City, CO 80022-2180

Re: Proposed Decision Document for the Interim Action for the
Groundwater Intercept and Treatment System North of Basin F
at Rocky Mountain Arsenal, August 1988

Dear Mr. Campbell:

Enclosed are the State's comments on the above-referenced document. As you know, Basin F is a Colorado Hazardous Waste Management Act ("CHWMA")/Resource Conservation and Recovery Act ("RCRA") unit and must be closed pursuant to the State's Modified Basin F Closure Plan. Therefore, these comments are submitted without waiving the State's legal position that Basin F is a CHWMA/RCRA unit.

If you have any questions, please call Jeff Edson with this Division.

Sincerely yours,

David C. Shelton
Director
Hazardous Materials and
Waste Management Division

DCS/me

Donald Campbell
September 28, 1988
Page 2

pc: Michael R. Hope, AGO
David L. Anderson, DOJ
Connally Mears, EPA
Mike Gaydosh, EPA
Chris Hahn, Shell Oil
Edward J. McGrath, HRO
Tony Truschel, GeoTrans

STATE COMMENTS ON PROPOSED DECISION DOCUMENT INTERIM
ACTION FOR THE GROUNDWATER INTERCEPT AND TREATMENT
SYSTEM NORTH OF BASIN F
AUGUST 1988

GENERAL COMMENTS

1. The groundwater intercept and treatment system north of Basin F must be constructed and operated in accordance with the State's Modified Basin F Closure Plan, the Colorado Hazardous Waste Management Act ("CHWMA")/the Resource Conservation and Recovery Act ("RCRA") and the regulations promulgated thereunder. These laws and regulations are not mere ARARs. They are non-waivable requirements of the Solid Waste Disposal Act pursuant to CERCLA Section 120(i).
2. The State has previously informed the Army that it supports all efforts which will result in the expeditious cleanup of the RMA and the reduction of the current threat to public health and the environment. The Basin F intercept and treatment system should be constructed and operated as soon as possible. The Draft Final Technical Program Schedule presented to the MOA parties on September 1, 1988 indicates that the system will not be operational until March 1991. The Decision Document should include a complete schedule and an explanation of the apparently extended periods of time for the design of and field work necessary to implement this interim action.

SPECIFIC COMMENTS

1. Pg. 8, para. 3 and pg. 9, para. 1. Given the high levels of fluoride, chloride and nitrate present in the groundwater north of Basin F, the treatment system should be designed and operated to effectively treat inorganic, as well as organic, contaminants to acceptable levels.
2. Pg. 11, para. 3. The text states that "[i]norganic contaminants do not currently warrant particular concern . . ." This statement is inaccurate and must be deleted from the text. The fact that the Army is not proposing to treat inorganic contaminants is not justification for declaring that the high levels of inorganic contaminants found north of Basin F do not warrant concern.
3. Pg. 14, Section 4.2.1.1. The plume of contamination north of Basin F is known to have a lateral width of over 1500 feet. However, the proposed decision document indicates that the extraction system will only be constructed with a lateral width of approximately 1000 feet. The proposal to construct the system to a width less than the known plume could result in significant amounts of contamination migrating around the extraction wells. Therefore, the intercept

system must either be constructed to a 1500 foot width or the design document must demonstrate that the 1000 width system will be capable of effectively intercepting and treating the maximum width of the plume.

4. Pg. 14, Section 4.2.1.1. The upper Denver sands are also known to be contaminated in the area north of Basin F. Specifically, wells 26041, 26043, 26047, 23054 and 23056 have detected Denver Formation contamination. The proposed decision document indicates that the extraction wells will be constructed to remove contamination only from the Alluvial aquifer. This design could result in contamination migrating under the extraction wells. Therefore, the design document must evaluate whether deeper extraction wells will be capable of effectively intercepting and treating the contamination detected in the upper Denver sands. If it appears technically feasible, the system should be constructed to intercept all contamination in the upper Denver Formation.
5. Pgs. 20 to 28, Section 8.0. Pursuant to the State's Modified Basin F Closure Plan and CHWMA, the Army must submit the proposed cleanup levels to the Colorado Department of Health for review and approval. Despite the fact that an

ARARs determination is unnecessary for a CHWMA unit such as Basin F, the State submits the following comments.

a. Section 121(d) of the Superfund Amendments and Reauthorization Act ("SARA") provides that, "such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act and water criteria established under Section 304 or 305 of the Clean Water Act." Furthermore, on March 27, 1987, the conferees involved in the CERCLA reauthorization process, wrote a letter to the U.S. Environmental Protection Agency "to advise you [Lee Thomas] of the requirements of Section 121 [of SARA] and the intent behind them." That letter also states that, "[t]he specific reference to MCLGs in the law makes it clear that these particular standards, where they are more stringent than the comparable MCLs are the primary standards under the Safe Drinking Water Act that must be attained by Superfund cleanups of groundwater." Therefore, pursuant to statutory requirements, unless the U.S. EPA determines that compliance with MCLGs is technically impracticable from an engineering perspective, MCLGs are the ARARs that must be attained. CERCLA, Section 121(d)(4)(c).

b. As the State has previously informed the Army (see State comments on the proposed Consent Decree), any activity conducted at RMA must be conducted in compliance with all statutes and regulations." However, the Army has consistently ignored all promulgated State statutes and regulations relating to the protection of water quality. This practice is inconsistent with U.S. EPA actions at Colorado RCRA and CERCLA sites and is not consistent with Section 121(d) of CERCLA. To the extent that State promulgated standards are more stringent than the federal standards, the State standards must be met. Attachment I contains State identified chemical specific standards which must be attained.

c. The Army should anticipate including the MCLGs and MCLs for the synthetic organics and inorganics which the U.S. EPA is proposing to promulgate under the Safe Drinking Water Act. Once promulgated, these MCLGs and MCLs will be applicable.

<u>Contaminant</u>	<u>Proposed MCLG</u>	<u>Proposed MCL</u>
Arsenic	0 ug/l	30 ug/l
Chlordane	0 ug/l	2 ug/l

DBCP	0 ug/l	.2 ug/l
Trans-1, 2-dichloroethylene	70 ug/l	70 ug/l
Ethyl benzene	700 ug/l	700 ug/l
Tetrachloroethylene	0 ug/l	2 ug/l
Xylene	10,000 ug/l	10,000 ug/l

5. Pg. 21-(5) Chloroform. The groundwater standard for chloroform should be 0.19 ug/l. Source: Federal Clean Water Act, in particular Water Quality Criteria for Protection of Human Health. It is inappropriate for the Army and DOJ to select the total trihalomethanes value of 100 ug/l as the action level for chloroform. The formation of trihalomethanes are a by-product of disinfection of domestic water supplies. Disinfection is not a necessary process of the treatment system and in fact has not been proposed.
6. Pg. 22-(14) Trichloroethylene (TCE). The groundwater standard for TCE should be 0 ug/l pursuant to the federal Safe Drinking Water Act MCLG.
7. At a minimum, the Army and DOJ should have selected action levels for the "target analytes" which were identified in the Final Alternatives Assessment report for this interim

action. State and federal standards exist for most of these "analytes". Please explain why these were not selected. The standards should be incorporated as appropriate.

8. Location specific ARARs for air emissions will need to be identified if air stripping or similar water treatment processes are required in order to meet all chemical specific ARARs.
9. The State's comments are based upon the Groundwater Intercept and Treatment System as proposed in this document and the Alternatives Assessment report for this interim action. The State reserves the right to identify additional comments, concerns and ARARs in the event this proposal is modified.

ATTACHMENT 1

STATE IDENTIFICATION OF CHEMICAL-SPECIFIC ARARS AT RMA
NORTH OF BASIN F

REFERENCE

- (1) Colorado Basic Standards for Ground Water, 5 CCR 1002-8, Section 3.11.0 - 3.11.9 (in particular Tables 1, 2, and 3).
- (2) Colorado Basic Standards and Methodologies, 5 CCR 1002-8, Section 3.1.0 - 3.1.20 (in particular Section 3.1.11).
- (3) Federal Safe Drinking Water Act (in particular Maximum Contaminant Level Goals - MCLGs).
- (4) Federal Safe Drinking Water Act (in particular Maximum Contaminant Levels - MCLs).
- (5) Federal Clean Water Act (in particular Water Quality Criteria for Protection of Human Health).

Water Quality Standard
(Reference)
all values in ug/l

<u>Chemical</u>	<u>Abbreviation</u>			
Aldrin	ALDRN	0(2)	0.000074(5)	
Arsenic	AS	50(1)	50(4)	
Barium	BA	1000(1)	1000(4)	
Benzene	C6H6		0(3)	5(4)
Benzothiazole	BTA/BTZ	0(2)		
Bicycloheptadiene	BCHPD	0(2)		
Chloride	CL	250,000(1)		
Chlorobenzene	CLC6H5	0(2)		
Chloroform	CHCL3	100(4)	note:total trihalo-methanes	0.19(5)
Chlorophenylmethyl sulfide	CPMS	0(2)		
Chlorophenylmethyl sulfone	CPMSO2	0(2)		
Chlorophenylmethyl sulfoxide	CPMSO	0(2)		
Chromium	CR	50(1)	1.2(3)*	50(4)
Copper	CU	200(1)	1300(3)*	
Dibromochloropropane	DBCP	0(2)	0(3)	
Dichlorodiphenyl trichloroethane	PPDDT	0(2)		
1,1-Dichloroethane	11DCLE	0(2)		
1,2-Dichloroethane	12DCLE		0(3)	5(4)
1,1-Dichloroethylene	11DCE		7(3)	7(4)
1,2-Dichloroethylene	12DCE	0(2)		
Dicyclopentadiene	DCPD	0(2)		
Dieldrin	DLDRN	0(2)	0.000071(5)	

Water Quality Standard
(Reference)
all values in ug/l

<u>Chemical</u>	<u>Abbreviation</u>		
Diisopropylmethyl phosphonate	DIMP	0(2)	
Dimethyldisulfide	DMDS	0(2)	
Dimethylmethylphosphate	DMMP	0(2)	
Dithiane	DITH	0(2)	
Endrin	ENDRN	0.2(1)	0.2(4)
Ethylbenzene	ETC6H5	0(2)	680(3)*
Fluoride	F	4000(1)	4000(4)
Hexachlorocyclopentadiene	CL6CP	0(2)	210(5)
Iron	FE	300(1)	
Isodrin	ISODR	0(2)	
Manganese	MN	50(1)	
Mercury	HG	2(1)	2(4)
Methylene chloride	CH2CL2	0(2)	
Methylisobutyl ketone	MIBK	0(2)	
Nitrate		10,000(1)	10,000(4)
Oxathiane	OXAT	0(2)	
pH	PH	6.5 - 8.5(1)	
Sulfate	SO4	250,000(1)	
Tetrachloroethylene	TCLEE	0(2)	0(3)*
Toluene	MEC6H5	0(2)	2000(3)*
1,1,2-Trichloroethane	112TCE	0(2)	0.6(5)
Trichloroethylene	TRCLE		0(3) 5(4)
Unknown(s)	UNK	0(2)	

Water Quality Standard
(Reference)
all values in ug/l

Chemical

Abbreviation

m-Xylene

13DMB

0(2)

Xylenes

XYLEN

0(2)

Zinc

ZN

500(1)

*Proposed Maximum Contaminant Level Goals

C:\WS2000\RMA\NBASIN-A.LST

RESPONSES TO COMMENTS BY THE STATE OF COLORADO ON THE PROPOSED
DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION FOR THE
GROUNDWATER INTERCEPT AND TREATMENT SYSTEM NORTH OF BASIN F
AUGUST 1988

GENERAL COMMENTS

Comment 1: The groundwater intercept and treatment system north of Basin F must be constructed and operated in accordance with the State's Modified Basin F Closure Plan, the Colorado Hazardous Waste Management Act ("RCRA") and the regulations promulgated thereunder. These are non-waivable requirements of the Solid Waste Disposal Act pursuant to CERCLA Section 120(i).

Response: As the State is aware, the United States position is that the interim response action will be conducted pursuant to CERCLA and that State requirements will be considered in the development of applicable or relevant and appropriate requirements consistent with CERCLA Section 121(d).

Comment 2: The State has previously informed the Army that it supports all efforts which will result in the expeditious cleanup of the RMA and the reduction of the current threat to public health and the environment. The Basin F intercept and treatment system should be constructed and operated as soon as possible. The Draft Final Technical Program Schedule presented to the MOA parties on September 1, 1988 indicates that the system will not be operational until March 1991. The Decision Document should include a complete schedule and an explanation of the apparently extended periods of time for the design of and field work necessary to implement this interim action.

Response: A more extensive schedule of milestones for this IRA will be provided in the Implementation Document. It is more appropriate at that time to provide greater detail because the IRA will have undergone further development and more specific data will be available upon which reasonable milestones can be based.

SPECIFIC COMMENTS

Comment 1: Pg. 8, para. 3 and pg. 8, para. 1. Given the high levels of fluoride, chloride and nitrate present in the groundwater north of Basin F, the treatment system should be designed and operated to effectively treat inorganic, as well as organic, contaminants to acceptable levels.

Response: The development of a treatment strategy for inorganics for this IRA at this time would unduly delay the implementation of this IRA and the significant beneficial effects which can be attained in the near term. The system will be able to be upgraded in the future to include such treatment, if necessary in the context of the comprehensive cleanup action at RMA. The ability to install a beneficial system within the short-term is considered to be of significant value by the Army.

Comment 2: Pg. 11, para. 3. The text states that "[i]norganic contaminants do not currently warrant particular concern" This statement is inaccurate and must be deleted from the text.

The fact that the Army is not proposing to treat inorganic contaminants is not justification for declaring that the high levels of inorganic contaminants found north of Basin F do not warrant concern.

Response: For purposes of this IRA, inorganics were a matter of concern regarding their ability to scale or foul the planned organic treatment process but not as compounds that could be treated by the intended available technology consistent with the need to maintain reasonable speed in implementation. The statement cited was not meant to preclude the treatment of inorganics in the future by improvements to this system or within the context of the Final Response Action. The text has been modified to clarify this approach.

Comment 3: Pg. 14, Section 4.2.1.1. The plume of contamination north of Basin F is known to have a lateral width of over 1500 feet. However, the proposed decision document indicates that the extraction system will only be constructed with a lateral width of approximately 1000 feet. The proposal to construct the system to a width less than the known plume could result in significant amounts of contamination migrating around the extraction wells. Therefore, the intercept system must either be constructed to a 1500 foot width or the design document must demonstrate that the

1000 width system will be capable of effectively intercepting and treating the maximum width of the plume.

Response: In Section 4.2.1.1, the exact width of the extraction system is not specified but general parameters are provided (8 to 10 wells at 80 to 100 feet apart) for purposes of review and comment. The exact number of wells and the well spacing can not be properly determined until the final design of the system is completed during the implementation phase. Consistent with the purpose of this IRA as stated in Section 3.0, the system will be designed to capture and treat contaminated alluvial aquifer waters which flow to the north of Basin F. The system will be designed to capture the largest volume of contaminated groundwater practicable considering hydrogeology, technology and cost-effectiveness.

Comment 4: Pg. 14, Section 4.2.1.1. The upper Denver sands are also known to be contaminated in the area north of Basin F. Specifically, wells 26041, 26043, 26047, 23054 and 23056 have detected Denver Formation contamination. The proposed decision document indicates that the extraction wells will be constructed to remove contamination only from the Alluvial aquifer. This design could result in contamination migrating under the extraction wells. Therefore, the design document must evaluate whether deeper extraction wells will be capable of effectively

intercepting and treating the contamination detected in the upper Denver sands. If it appears technically feasible, the system should be constructed to intercept all contamination in the upper Denver Formation.

Response: This IRA is intended to capture and treat as much contaminated water in the alluvial aquifer as is practicable. In that there are zones of contact between the alluvial aquifer and the upper Denver Sands that contain contaminated groundwater, design of the intercept system will consider placement of extraction wells in those contact zones where technically feasible. It is not practicable to attempt, within the context of this IRA, to construct extraction wells to intercept all contamination in the upper Denver Formation. Future improvements and actions in conjunction with the Final Response Action will review and evaluate the need for further remediation of contaminated groundwater in both the alluvial aquifer and Denver Formation.

Comment 5: Pgs. 20 to 28, Section 8.0. Pursuant to the State's Modified Basin F Closure Plan and CHWMA, the Army must submit the proposed cleanup levels to the Colorado Department of Health for review and approval. Despite the fact that an ARARs determination is unnecessary for a CHWMA unit such as Basin F, the State submits the following comments:

a. Section 121(d) of the Superfund Amendments and Reauthorization Act ("SARA") provides that, "such remedial action shall require a level or standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act and water criteria established under Section 305 or 305 of the Clean Water Act." Furthermore, on March 27, 1987, the conferees involved in the CERCLA reauthorization process, wrote a letter to the U.S. Environmental Protection Agency "to advise you [Lee Thomas] of the requirements of Section 121 [of SARA] and the intent behind them." That letter also states that, "[t]he specific reference to MCLGs in the law makes it clear that these particular standards, where they are more stringent than the comparable MCLs are the primary standards under the Safe Drinking Water Act that must be attained by Superfund cleanups of groundwater." Therefore, pursuant to statutory requirements, unless the U.S. EPA determines that compliance with MCLGs is technically impracticable; from an engineering perspective, MCLGs are the ARARs that must be attained. CERCLA, Section 121(d)(4)(c).

Response: The State appears to make no differentiation between an interim response action and a final remedy with this approach. The Army is aware of no guidance from EPA which would apply MCLGs to interim response actions. From a policy perspective, it appears that application of MCLGs to IRAs would be a disincentive

to conduct IRAs, the party preferring to develop a single remedial system which could attain such standards no matter how long it may take to develop. In determining which standards are relevant and appropriate to apply to a specific IRA the Army considers the particular facts surrounding that action. This IRA will treat groundwater which will be released in an area where there is no human exposure, this groundwater will flow towards other treatment systems during the following few years, where it will be treated again. Under these circumstances it has been determined by the Army that MCLGs are not relevant and appropriate to apply in the context of this interim action. This approach is consistent with the statutory provision to apply such standards where they are relevant and appropriate under the circumstances. CERCLA Section 121 (d)(2)(A).

Comment 5b: As the State has previously informed the Army (see State comments on the proposed Consent Decree), any activity conducted at RMA must be conducted in compliance with all statutes and regulations." However, the Army has consistently ignored all promulgated State statutes and regulations relating to the protection of water quality. This practice is inconsistent with U.S. EPA actions at Colorado RCRA and CERCLA sites and is not consistent with Section 121(d) of CERCLA. To the extent that State promulgated standards are more stringent than the federal standards, the state standards must be met. Attachment I

contains State identified chemical specific standards which must be attained.

Response: The Army has reviewed the State standards identified in Attachment 1 to the State's comments concerning this proposed decision document. The Army previously provided responses concerning the determination that the Colorado Basic Standards for Ground Water, 5 CCR 1002-8 and Colorado Basic Standards and Methodologies, 5 CCR 1002-8, were neither applicable nor relevant and appropriate to apply in the context of this IRA in response to the State's comments (June 1, 1988) on the Draft ARAR document for this IRA and the State is referred to that discussion.

c. The Army should anticipate including the MCLGs and MCLs for the synthetic organics and inorganics which the U.S. EPA is proposing to promulgate under the Safe Drinking Water Act. Once promulgated, these MCLGs and MCLs will be applicable.

<u>Contaminant</u>	<u>Proposed MCLG</u>	<u>Proposed MCL</u>
Arsenic	0 ug/l	30 ug/l
Chlordane	0 ug/l	2 ug/l
DBCP	0 ug/l	.2 ug/l
Trans-1, 2-dichloroethylene	70 ug/l	70 ug/l
Ethyl benzene	700 ug/l	700 ug/l
Tetrachlorethylene	0 ug/l	2 ug/l

Xylene 10,000 ug/l 10,000 ug/l

Response: The Army understands that the ARAR process is dynamic. However, proposed standards are subject to change prior to their being issued as final standards. They may not ever become final standards or they may be revised upwards or downwards. With that knowledge, the Army has determined to apply only those standards which have completed the review process and been promulgated as final standards by the regulatory agency concerned.

Comment 5 (sic): Pg. 21-(5) Chloroform. The groundwater standard for chloroform should be 0.19 ug/l. Source: Federal Clean Water Act, in particular Water Quality Criteria for Protection of Human Health. It is inappropriate for the Army and DOJ to select the total trihalomethanes value of 100 ug/l as the action level for chloroform. The formation of trihalomethanes are a by-product of disinfection of domestic water supplies. Disinfection is not a necessary process of the treatment system and in fact has not been proposed.

Response: The Army has selected the MCL for this compound as being relevant and appropriate to apply in the context of this IRA. The MCL was considered appropriate since it was specifically developed for drinking water and is a requirement

for public water systems. The AWQC suggested was based upon considerations, such as protection of aquatic resources in surface waters, that are unrelated to the factual context of this IRA and was not considered relevant and appropriate to apply in these specific factual circumstances.

Comment 6: Pg. 22-(14) Trichloroethylene (TCE). The groundwater standard for TCE should be 0 ug/l pursuant to the federal Safe Drinking Water Act MCLG.

Response: The Army's approach to MCLG's is discussed in response to Comment 5a above. The Army will apply the MCL for TCE (5 ug/l) as an ARAR for this interim action.

Comment 7: At a minimum, the Army and DOJ should have selected action levels for the "target analytes" which were identified in the Final Alternatives Assessment report for this interim action. State and federal standards exist for most of these "analytes". Please explain why these were not selected. The standards should be incorporated as appropriate.

Response: The document has been revised to reflect additional standards and discuss the practicability of attaining such standards within the context of this IRA.

Comment 8: Location specific ARARs for air emissions will need to be identified if air stripping or similar water treatment processes are required in order to meet all chemical specific ARARs.

Response: The Army understands that, if air stripping is adopted in the future for treatment within the context of this IRA, potential air emission standards will need to be evaluated and ARARs for air emissions may be appropriate.

9. The State's comments are based upon the Groundwater Intercept and Treatment System as proposed in this document and the Alternatives Assessment report for this interim action. The State reserves the right to identify additional comments, concerns and ARARs in the event this proposal is modified.

Response: No response is necessary to this comment.

Shell Oil Company



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September 28, 1988

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald L. Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Dear Mr. Campbell:

Enclosed herewith are Shell Oil's comments on proposed Decision Document for the Groundwater Intercept and Treatment System North of Basin F, Rocky Mountain Arsenal.

Sincerely,

R. D. Lundahl
Manager Technical
Denver Site Project

RDL:ajg

Enclosure

cc: (w/enclosure)
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SHELL OIL SPECIFIC COMMENTS ON PROPOSED DECISION DOCUMENT
FOR THE GROUNDWATER INTERCEPT AND TREATMENT SYSTEM
NORTH OF BASIN F, ROCKY MOUNTAIN ARSENAL

1. Page 1, first paragraph.

The revised proposed Consent Decree is dated June 7, 1988.

2. Page 1, fourth paragraph.

In addition to technical feasibility, timing and cost, the Alternatives Assessment also considered the ability of alternatives to achieve IRA objectives.

The last sentence states: "Extraction will be executed by the implementation of withdrawal wells; treatment will be by carbon absorption filter; and recharge wells will be constructed to reintroduce the treated water to the aquifer downgradient in addition to creating a hydraulic barrier."

Because additional data (in the form of design calculations and additional field data, for example) are needed to make the best choices at the process level (for example, between a physical, hydraulic or no barrier) and because decisions on these choices are interactive, these choices should be made during design, not at the Decision Document stage. This applies to process choices on extraction, treatment, recharge and barriers.

3. Page 5, last paragraph.

See comment 1.

4. Page 7, first paragraph.

The second sentence states: "A result of this IRA will be a reduction in the contaminant loading on the North Boundary Containment/Treatment System."

Although this result may occur at some time in the distant future, it is not an objective of this IRA. See comment 10.

5. Page 7, third paragraph.

Substitute for this paragraph:

"In addition to these specific objectives, the system as designed and constructed should adhere to good engineering practices."

6. Page 9, first paragraph.

This paragraph is superfluous and should be deleted. As covered in the prior paragraph, it is appropriate not to treat inorganics as an interim response action because no knowledge presently exists as to the necessity or desirability of treating inorganics in the Final Response Actions.

7. Page 10, first (carryover) paragraph.

In the last sentence, recycled water increases the costs of treatment and reinjection as well as extraction costs.

8. Page 11, fourth paragraph.

Granular activated carbon is also being used successfully to treat organics at the Northwest Boundary Control System.

9. Page 18, 6.0 Summary of the Interim Response Action Project.

Shell disagrees with the Army's approach on this and other IRA's of reaching decisions in Alternative Assessment and Decision Documents which can only be, or are best made, during the final design and cost analyses phase. As one example from this Decision Document, the first paragraph of 6.0 states: "The (hydrogeologic) system will utilize 8 to 10 extraction wells spaced at approximately 100 foot intervals. The recharge wells will mirror the extraction wells and be located 100 feet hydraulically downgradient of the extraction wells." The specificity of this description of the hydrogeologic system implies a detailed design and cost analyses of the total system (including treatment options since hydrogeologic system design affects at least the sizing of the treatment system). However, no supporting documentation or even discussion of the basis for this decision on geohydrologic system configuration is provided in this Decision Document. It should be sufficient only to confirm in this Decision Document that groundwater extraction, treatment and recharge are feasible and appropriate technologies for this IRA and to screen out processes within these technologies which are clearly not compatible with the purpose and objectives of the IRA.

Shell disagrees also with the apparent decision not to consider air stripping in the original final design (second paragraph of 6.0). Carbon absorption and air stripping are highly complementary processes for groundwater treatment and the decision to use either or both can only be based on detailed design and cost analyses. Shell agrees that air emission and operational data gaps exist which must be addressed before implementation. However, these gaps

are no more problematic than gaps which exist in other elements of the system. The option to include air stripping in the original design should be retained. The decision to exclude it appears to be an arbitrary one.

The decision to use an hydraulic barrier is also unnecessarily premature and arbitrary. In its comments (May 31, 1988) on the Basin F Intercept System Alternative Assessment, Shell provided a technical discussion on the concept of using no barrier in the Basin F Intercept System design. This concept is based on the very gentle hydraulic gradient north of Basin F because of which a continuous cone of depression formed by the extraction system would function both to intercept the flow of contaminated groundwater and to draw contaminated groundwater from downgradient (Section 23). The Army's response to this concept is puzzling. While seeming to agree that this concept is technically reasonable, and that it would provide an additional benefit (drawing contaminated water from downgradient of extraction wells), this concept was rejected on the basis that this benefit is not an objective of the IRA (page 84, last paragraph) even though agreeing such a system would probably be less costly in capital and O&M costs (page 88, response to comment 15). (Page references refer to Army response section of the Final Alternatives Assessment document for this IRA). Shell does not agree that the drawing of groundwater from downgradient of extraction wells is in any way contrary to this IRA's objectives. So long as the quantity of contaminants removed by the system approximates (or exceeds) the quantity believed to be emanating from Basin F, it should not matter from which direction around the wells the contaminants are drawn. The decision on a barrier should be made during the design phase of this IRA.

10. Page 20, second paragraph of 8.3.1.

The first sentence states: "The purpose of this IRA is to reduce the level of contamination in the groundwater north of Basin F in order to improve the efficiency and efficacy of treatment by the RMA boundary systems."

This statement is not consistent with the discussion under 3.0 Interim Response Action Objectives on page 7 and does not accurately capture the objective of this IRA. Moreover, neither in this document nor in the Alternatives Assessment document is there discussion of how this IRA will affect the boundary systems. Shell believes it is unlikely that this IRA can on a cost/benefit basis be justified on the basis of improved efficiency of the RMA boundary systems. The purpose of this IRA is simply to prevent enlargement of the groundwater contamination problem during the five or more

years before a Final Remedy will be implemented. This purpose is adequately reflected in the first specific objective listed on page 7 of this document and is also consistent with the Army's response to Shell's General Comments on the Alternatives Assessment document, viz. "The intent of this IRA is to stop the further spread of contaminants which may be emanating from below Basin F and migrating via the alluvial groundwater." (last paragraph on page 84 of the Final Alternatives Assessment document for this IRA).

11. Page 20, second paragraph of 8.2.

Shell questions why the Army continues to refer to the lack of response to the Army request that EPA, Shell and the State nominate ARARs. As the Army is aware, the request for comments was outside of the ARAR selection process detailed in the RI/FS Process Document.

12. Page 20, 8.3.1, Ambient or Chemical-Specific ARARs

In light of the appropriate purposes for this IRA set forth in comment #10 above, health-based concentration levels should not be considered as ARARs, because no humans will drink the treated groundwater until further treatment at the existing boundary systems or at other future systems that may become part of the remedy. For this reason, the discussion under 8.3.1 and the standards should be deleted because they are health-based. Shell sets forth below additional reasons for deleting the proposed "ambient or chemical-specific" ARARs.

The levels based on the National Primary Drinking Water Standards or MCLs are particularly not relevant and appropriate because they are intended to be protective of water at the tap used for drinking. See arsenic, benzene, carbon tetrachloride, chloroform, 1,2-dichloroethene, 1,1-dichloroethylene, endrin, mercury, 1,1,1-trichloroethane, and trichloroethylene. In addition, Shell disagrees with all MCLs based on CAG methodology, including the MCL for benzene, carbon tetrachloride, 1,2-dichloroethene, 1,1-dichloroethylene, 1,1,1-trichloroethane, and trichloroethylene.

Shell further disagrees with the selection of the maximum concentration of constituents in Table 1 of 40 C.F.R. § 264.94 for groundwater protection as ARARs, including ones for arsenic and mercury. These standards are intended to apply at the boundary of a waste management area and to trigger corrective action for surface impoundments, waste piles and land treatment units or landfills that receive hazardous waste after July 26, 1982. See 40 C.F.R. §§ 264.90(a)(2), 264.92. The location of the recharge wells is not premised on any waste management area. Further, since the Arsenal is being remediated pursuant to CERCLA and this IRA does not involve remediation in a surface impoundment, waste pile, land treatment unit or landfill, the section 264.94(a)(2) limits should not be ARARs.

We disagree with the chlorobenzene level because it has been derived from non-referenced sources for the protection of human health. The references do not advise the reader on the toxicological endpoints considered or the assumptions incorporated in performing the calculations for values protective of human health. Furthermore, the standard attempts to protect biota in surface water, which may not be appropriate for groundwater.

The TPES in section 129.101(a)(3) for DDT is not 10 ug/l. Shell disagrees with the TPES for this chemical because it is based on the assumption that there is not a demonstrated "no effect level." Further, EPA never had in mind the protection of groundwater when promulgating TPES, which are intended to protect surface water.

Shell questions whether 0.12 ug/l is the TPES for dieldrin. It disagrees with the ambient water criterion for aldrin/dieldrin in navigable waters based on an FDA tolerance level of 0.3 ppm for fish times an application factor of 0.01. 40 C.F.R. § 129.100(a)(3). It rejects the assumption underlying this criterion that "there is no demonstrated 'no effect level'." See 41 Fed. Reg. 23, 584 (1976). As Shell has previously explained in comments, developments in modelling, such as those by Robert Sielken, indicate that this assumption is invalid. In addition, a water quality criterion designed to provide for protection of aquatic life is not relevant and appropriate. The criterion was intended to address the impact of bioaccumulation in fish and their food sources on the biological transport of aldrin/dieldrin to birds and to mammals, including man. 41 Fed. Reg. 23,584 (1976).

Furthermore, aldrin and dieldrin are considered by the EPA CAG to be animal carcinogens and suspected human carcinogens. As stated in previous comments, numerous carcinogenicity tests in a variety of animals indicate that aldrin and dieldrin promote only liver tumors and the tumors develop only in mice. On the basis of this species-specific effect, aldrin and dieldrin are improperly categorized by the EPA as animal carcinogens.

Shell rejects the Army proposal of 206 ug/l as an ARAR for hexachlorocyclopentadiene because it has not been adjusted for drinking water only.

The Army lists the wrong MCL for TCE; it should be 5 ug/l.

13. Page 22, 8.3.2 Location-Specific ARARs

The Army's response to Shell comments, dated August 25, 1988, fails to explain why it believes that the intake and other elements of public water systems, which must provide a continuous supply of safe drinking water, are similar to this IRA.

14. Page 24, 8.3.3 Performance, Design or Other Action-Specific ARARs

Shell continues to believe that, while worker protection requirements must be satisfied, they are not ARARs.

Shell continues to disagree with the proposal of Colorado Air Pollution Control Commission Regulation No. 1, section VII (D)(2)(b) ("construction activities") as an ARAR for the reasons set forth in our May 31, 1988 letter on the Draft ARARs Document.

While Shell does not object to satisfaction of the Colorado Noise Abatement Statute, the statute is not an ARAR because it does not relate to a level or degree of cleanup.

Shell disagrees that all substantive requirements of parts 262, 263, and Subparts I and L of part 264 should be ARARs for materials determined to be hazardous wastes. The difference between substantive and procedural requirements is not always clear. Shell suggests that, at the time that any determination is made regarding whether the soil is a hazardous waste and that the soil cannot be placed back into the excavation, each provision of the RCRA regulations be analyzed separately to evaluate whether it should be selected as a possible ARAR.

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RESPONSES TO COMMENTS SUBMITTED BY SHELL OIL COMPANY ON THE
PROPOSED DECISION DOCUMENT FOR THE GROUNDWATER TREATMENT SYSTEM
NORTH OF BASIN F INTERIM RESPONSE ACTION AT ROCKY MOUNTAIN
ARSENAL

Comment 1: Page 1, the revised proposed Consent Decree is dated June 7, 1988.

Response: The document has been revised in response to this comment.

Comment 2: Page 1, in addition to technical feasibility, timing and cost, the Alternatives Assessment also considered the ability of the alternatives to achieve IRA objectives. The document states; "Extraction will be executed by the implementation of withdrawal wells; treatment will be by carbon absorption filter; and recharge wells will be constructed to reintroduce the treated water to the aquifer downgradient in addition to creating a hydraulic barrier." Because additional data are needed to make the best choices at the process level and because decisions on these choices are interactive, these choices should be made during design, not at the decision document stage. This applies to process choices on extraction, treatment, recharge and barriers.

Response: The first sentence of the fourth paragraph has been revised in response to this comment.

The preferred alternatives cited in the proposed Decision Document were selected based upon the indicated selection criteria and capability to meet the IRA objectives. It was determined that sufficient field data was available on which to base process selection. If additional data gathered or calculations performed during the design phase of this project indicate that other alternatives deserve consideration based upon any new substantive information, then at that time an appropriate evaluation can be made concerning any modifications.

Comment 3: Page 5, see comment 1.

Response: The document has been revised in response to this comment.

Comment 4: Page 7, the document states; "A result of this IRA will be a reduction in the contaminant loading on the North Boundary Containment/Treatment System." Although this result may occur at some time in the distant future, it is not an objective of this IRA.

Response: While not a specific objective delineated for this IRA, the expected result of reducing contaminant loading on the North Boundary System is considered by the Army to be important

in the long-term cleanup program for RMA. While measureable benefits at the North Boundary System probably will not occur for perhaps 3 - 5 years, this period of time is relatively short when considering the entire program.

Comment 5: Page 7, substitute for third paragraph this statement: "In addition to these specific objectives, the system as designed and constructed should adhere to good engineering practices."

Response: The document has been revised in response to this comment.

Comment 6: Page 9, the first paragraph is superfluous and should be deleted. It is appropriate not to treat inorganics as an interim response action because no knowledge presently exists as to the necessity or desirability of treating inorganics in the Final Response Actions.

Response: The Army disagrees with this comment and has not revised the document.

Comment 7: Page 10, recycled water increases the costs of treatment and reinjection as well as the extraction costs.

Response: The document has been revised in response to this comment.

Comment 8: Page 11, granular activated carbon is also being used successfully to treat organics at the Northwest Boundary Control System.

Response: The document has been revised in response to this comment.

Comment 9: Page 18, Shell disagrees with the Army's approach on this and other IRA's of reaching decisions in Alternative Assessment and Decision Documents which can only be, or are best made, during the final design and cost analyses phase. In the first paragraph of Section 6.0 specific numbers and spacing of recharge and extraction wells are discussed. The specificity of this description of the hydrogeologic system implies a detailed design and cost analyses of the total system, including treatment options. No supporting documentation or discussion of the basis for this decision is provided in the document. It should be sufficient to confirm that groundwater extraction, treatment and recharge are feasible and appropriate technologies for this IRA and to screen out processes within these technologies which are clearly not compatible with the purposes and objectives of the IRA.

Shell disagrees also with the apparent decision not to consider air stripping in the original final design. Carbon absorption and air stripping are highly complementary processes for groundwater treatment and the decision to use either or both

can only be based on detailed design and cost analyses. The air emission and operational data gaps which exist are no more problematic than gaps which exist in other elements of the system. The option to include air stripping in the original design should be retained. The decision to exclude it appears to be an arbitrary one.

The decision to use an hydraulic barrier is also unnecessarily premature and arbitrary. Shell provided a technical discussion of the concept of using no barrier in its comments on the Alternatives Assessment. The Army's response was puzzling. While seeming to agree that this concept was technically reasonable and would provide an additional benefit, this concept was rejected on the basis that this benefit was not an objective of the IRA. The decision on a barrier should be made during the design phase of this IRA.

Response: See response to Shell's Comment No. 2.

The decision to exclude air stripping from the preferred treatment alternative was based, in part, on the determination that carbon adsorption was capable of adequately removing organic compounds found in the groundwater north of Basin F without there being a need to incur the capital costs associated with an air stripping system. There is a strong potential for there to be a need for expensive additional treatment for inorganics to avoid scaling of an air stripper system. Nevertheless, the treatment system will be designed to allow for the addition of an air stripper in the future.

The Army believes that the decision to use an hydraulic barrier is appropriate. A physical barrier was considered, as reflected in the Final Alternatives Assessment, and determined to be less cost-efficient. The Army is prepared to reevaluate the use of a physical barrier if information developed during the design phase of this IRA indicates that such a physical barrier may be more appropriate.

Comment 10: Page 20, the document states, "The purpose of this IRA is to reduce the level of contamination in the groundwater north of Basin F in order to improve the efficiency and efficacy of treatment by the RMA boundary systems." This statement is not consistent with the IRA objectives listed under Section 3.0 and does not accurately capture the objective of this IRA. There is no discussion in this document or the Alternatives Assessment of how this IRA will affect the boundary systems. Shell believes it is unlikely that this IRA can on a cost/benefit basis be justified on the basis of improved efficiency of the RMA boundary systems. The purpose of this IRA is simply to prevent enlargement of the groundwater contamination problem during the five or more years before a Final Remedy will be implemented. This purpose is adequately reflected in the first specific paragraph on page 7 of this document.

Response: The language cited by Shell has been revised.

Comment 11: Shell questions why the Army continues to refer to the lack of response to the Army request that EPA, Shell and the State nominate ARARs. As the Army is aware, the request for comments was outside the ARAR selection process detailed in the RI/FS Process Document.

Response: The reference is only intended to note coordination concerning development of ARARs. There is no implication that a response was required. In the case of some interim actions, responses were received to similar early solicitations but there was no obligation for parties to research and recommend potential ARARs for consideration by the Army. However, the Army believes it appropriate to refer to such coordination.

Comment 12: Page 20, Section 8.3.1, In light of the appropriate purposes for this IRA, health-based concentration levels should not be considered as ARARs because no humans will drink the treated water until further treatment at the existing boundary treatment systems or at future systems which will become part of the remedy. The discussion under 8.3.1 and the standards should be deleted because they are health-based.

The levels based on the National Primary Drinking Water Standards or MCLs are particularly not relevant and appropriate because they are intended to be protective of water at the tap used for drinking. In addition, Shell disagrees with all MCLs based on CAG methodology.

Shell further disagrees with the selection of the maximum concentration of constituents in Table 1 of 40 C.F.R. Section 264.94 for groundwater protection as ARARs, including ones for arsenic and mercury. These standards are intended to apply at the boundary of a waste management area and to trigger corrective action for surface impoundments, waste piles and land treatment units or landfills that receive hazardous waste after July 26, 1982. The location of the recharge wells is not premised on any waste management area. Further, since the Arsenal is being remediated pursuant to CERCLA and this IRA does not involve remediation of a surface impoundment, waste pile, land treatment unit or landfill, these limits should not be ARARs.

We disagree with the chlorobenzene level because it has been derived from non-referenced sources for the protection of human health. The references do not advise the reader on the toxicological endpoints considered or the assumptions incorporated in performing the calculations for values protective of human health. Furthermore, the standard attempts to protect biota in surface water, which may not be appropriate for groundwater.

The TPES in section 129.101(a)(3) for DDT is not 10 ug/l. Shell disagrees with the TPES for this chemical because it is based on the assumption that there is not a demonstrated "no effect level." Further, EPA never had in mind the protection of groundwater when promulgating TPES, which are intended to protect surface water.

Shell questions whether 0.12 ug/l is the TPES for dieldrin. It disagrees with the ambient water criterion for aldrin/dieldrin

in navigable waters based on the FDA tolerance level of 0.3 ppm for fish times an application factor of 0.01. It rejects the assumption underlying this criterion that "there is no demonstrated no effect level." As Shell has previously explained in comments, developments in modelling, such as those by Robert Sielken, indicate that this assumption is invalid. In addition, a water quality criterion designed to provide protection of aquatic life is not relevant and appropriate. The criterion was intended to address the impact of bioaccumulation in fish and their food sources on the biological transport of aldrin/dieldrin to birds and mammals, including man.

Furthermore, aldrin and dieldrin are considered by EPA CAG to be animal carcinogens and suspected human carcinogens. As stated in previous comments, numerous carcinogenicity tests in a variety of animals indicate that aldrin and dieldrin promote only liver tumors and only in mice. On the basis of this species-specific effect, aldrin and dieldrin are improperly characterized by EPA as animal carcinogens.

Shell rejects the Army proposal of 206 ug/l as an ARAR for hexachlorocyclopentadiene because it has not been adjusted for drinking water only.

The Army lists the wrong MCL for TCE, it should be 5 ug/l.

Response: The Army determined that the standards listed in Section 8.3.1 as chemical-specific ARARs were not applicable to this IRA because the contemplated system was not a public water system and did not provide drinking water to individuals. However, these standards were determined to be relevant and appropriate to apply at the point of reinjection of the treated water. In general, the Army considered the potential for human exposure over the long-term, the fact that treated water would potentially be available at some future date for a variety of uses, the fact that treated water would at some time flow beyond boundaries under Army control, the ability to achieve standards while maintaining appropriate speed in establishing the IRA, the benefit to the boundary treatment systems of a reduced contaminant loading in the future and that potential effect on final remediation, and similar considerations. In reviewing these concerns, the Army determined that the listed standards were relevant and appropriate under the circumstances to apply to this IRA, although there is no known current human exposure to this water as drinking water.

Several of Shell's comments address the methodology used by EPA to establish particular standards for compounds, such as the CAG methodology. Shell is in the process of presenting some of its concerns in this area and some of its recently developed data to EPA for their consideration. EPA, as the primary technical agency in this area for the United States, determines the appropriate methodology and standards to utilize when developing criteria for compounds. The Army accepts the standards set by EPA for specific compounds and attempts to apply them in particular interim actions in accordance with current guidance.

Shell is correct in their comment concerning the appropriate standard for TCE and the document has been corrected.

The Army has revised Section 8.3.1 based upon some of the general concerns raised by Shell in this comment.

Comment 13: Page 22, Section 8.3.2 discusses location-specific ARARs. The Army's response to Shell's comments, dated August 25, 1988, fails to explain why it believes that the intake and other elements of public water systems, which must provide a continuous supply of safe drinking water, are similar to this IRA.

Response: The Army has determined that it is relevant and appropriate to apply the siting requirements for public water systems to this interim action. While the Basin F system will not be a supplier of drinking water, the focus of these siting requirements is to ensure that such systems are constructed in areas where they are not subject to unreasonable risk from certain geological or physical events. The Basin F system is similar to a drinking water supply system in that it treats groundwater and has certain similar construction. It is an expensive undertaking to install and considered important to the RMA comprehensive cleanup program. In considering these factors, the Army concluded that these siting requirements were relevant and appropriate to apply in the context of this IRA.

Comment 14: Shell continues to believe that, while worker protection requirements must be satisfied, they are not ARARs.

Shell continues to disagree with the proposal of Colorado Air Pollution Control Commission Regulation No. 1, section (D)(2)(b) as an ARAR for the reasons set forth in our May 31, 1988 letter on the Draft ARARs Document.

While Shell does not object to satisfaction of the Colorado Noise Abatement Statute, the statute is not an ARAR because it does not relate to a level or degree of cleanup.

Shell disagrees that all substantive requirements of parts 262, 263 and subparts I and L of part 264 should be ARARs for materials determined to be hazardous wastes. The difference between substantive and procedural requirements is not always clear. Shell suggests that, at the time that any determination is made regarding whether the soil is a hazardous waste and that the soil cannot be placed back in the excavation, each provision of the RCRA regulations be analyzed separately to evaluate whether it should be selected as a possible ARAR.

Response: The Army believes that worker protection standards should be considered as ARARs, particularly in view of the direct reference to such standards in CERCLA. The Army considered the Colorado Air Pollution Control Commission Regulation No.1, Section (D)(2)(b) as relevant and appropriate to apply to this IRA to provide protection for air quality during construction. The Noise Abatement Statute is specifically applicable to construction projects.

While it may be difficult at times to distinguish between substantive and procedural requirements of RCRA, this is no more difficult than many other aspects of administering the cleanup program for RMA. The Army does not believe that there is a

significant difference between the approach suggested by Shell and the approach intended by the Army in addressing hazardous wastes. As stated in the Proposed Decision Document, the specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage or disposal techniques actually applied to such material.